April 9, 2020

Wyoming State Loan & Investment Board
Asset Allocation Recommendations

Asset Allocation Recommendation Summary

Capital Markets Assumptions & Asset Allocation Process

- Each year, RVK's general consulting and research teams collaborate to review the capital market environment and update long-term, forward-looking capital market (CM) expectations for each asset class utilized by our clients.

- The components we estimate include:
  - Return
  - Risk (volatility of returns)
  - Correlation (relationship of asset class returns with all other asset classes)

- Annual updates are typically gradual and incorporate historical performance, current valuations, as well as the overall economic environment.

- The process for reviewing asset allocation involves RVK and the IFC collaborating on potential enhancements and adjustments to asset allocation targets.

- After extensive discussion of the capital markets environment and modeling of potential changes to asset allocation targets, the IFC and RVK develop a series of recommendations that are then reviewed with the SLIB.

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Recap of 2020 Asset Allocation Process

- RVK and the IFC met on February 21st and developed a series of recommendations.
  - The recommendations centered on decreasing non-core fixed income (EMD in particular) in favor of international equities, and adjusting the mix of core vs. non-core real estate to a more equal split between the two.

- The initial set of recommendations were brought to the SLIB working session on asset allocation on March 18th. At that point in time, market conditions had changed significantly as a result of the COVID-19 virus pandemic.
  - The working session resulted in a modified set of recommendations. Elements of the original recommendations were kept, such as increasing international equity and balancing out the real estate allocations. Primary modifications included:
    - A reduction of the core fixed income allocation in the Total Return and Income Focus Pools.
    - A 2nd alternative recommendation for Pool A was developed, including increases to international equity, preferred stock and bank loans via elimination of the 5% target to cash equivalents.

- Additional asset allocation adjustments can be considered later in the year, once markets have stabilized enough to develop an updated set of capital market assumptions.

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Summary of Asset Allocation Recommendations

> The recommended target portfolios have higher expected returns than current targets, achieved through increasing capital appreciation assets and reducing capital preservation assets.

Total Return Focus
- ☑ Increase Broad International Equity (+4.0%)
- ☑ Decrease Core Fixed Income (-4.0%)

Income Focus
- ☑ Increase Broad International Equity (+2.0%)
- ☑ Decrease Core Fixed Income (-2.0%)

Pool A #1
- ☑ Add Core Real Estate (+4.0%)
- ☑ Decrease Non-Core Real Estate (-4.0%)

Pool A #2
- ☑ Increase Broad International Equity (+2.0%)
- ☑ Increase Preferred Stock (+2.0%)
- ☑ Add Core Real Estate (+4.0%)
- ☑ Increase Bank Loans (+1.0%)
- ☑ Decrease Non-Core Real Estate (-4.0%)
- ☑ Eliminate Cash Target (-5.0%)

Workers Compensation
- ☑ Increase Broad International Equity (+2.5%)
- ☑ Decrease Emerging Markets Debt (-2.5%)

LSRA Long-Term Reserve
- ☑ **No changes recommended due to uncertainty of cash flow projections.**

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Summary of Asset Allocation Recommendations
Total Return and Income Focus

ASSET CLASS	TOTAL RETURN			INCOME		
	CURRENT	ALT #1	+/-	CURRENT	ALT #1	+/-
Broad US Equity	11.0	11.0	-	8.0	8.0	-
Small Cap US Equity	3.0	3.0	-	2.0	2.0	-
Broad International Equity	14.0	18.0	+4.0	10.0	12.0	+2.0
Preferred Stock	-	-	-	3.0	3.0	-
MLPs	5.5	5.5	-	7.0	7.0	-
Private Equity	8.0	8.0	-	-	-	-
Core Real Estate	6.0	6.0	-	11.0	11.0	-
Non-Core Real Estate	5.0	5.0	-	3.0	3.0	-
Hedge Funds	7.5	7.5	-	-	-	-
US Agg Fixed Income	29.0	25.0	-4.0	37.0	35.0	-2.0
WC Liability Hedging Fixed Income*	-	-	-	-	-	-
Bank Loans	6.0	6.0	-	12.0	12.0	-
Custom Emerging Markets Debt	5.0	5.0	-	7.0	7.0	-
Cash Equivalents	-	-	-	-	-	-
Total	100.0	100.0	-	100.0	100.0	-

Consists of 58% Long Duration Fixed Income and 42% US Agg Fixed Income with an estimated duration of 11.6 years.

Asset Class Composition - Asset classes defined by their primary category

Fixed Income & Cash	40	36	-4	56	54	-2
Public Equity & Alternatives	60	64	+4	44	46	+2

Thematic Composition - Asset classes defined by their primary investment objective

Capital Appreciation	46	50	+4	33	35	+2
Capital Preservation	29	25	-4	37	35	-2
Alpha	8	8	-	0	0	-
Inflation	18	18	-	30	30	-

RVK 2020 Capital Market Assumptions - Return, standard deviation, and yield

Expected Return (Arithmetic)	5.85	6.07	+0.22	5.21	5.31	+0.10
Expected Risk (Standard Deviation)	8.68	9.34	+0.66	6.81	7.09	+0.28
Expected Return (Compound)	5.50	5.66	+0.16	4.99	5.07	+0.08
Est. Yield (03/19/20)	4.22	4.30	+0.08	5.64	5.68	+0.04

Liability-Driven Risk Metrics - Applicable to Workers' Compensation only

Expected Risk (Surplus Volatility)	-	-	-	-	-	-
Est. Interest Hedge Ratio	-	-	-	-	-	-
Est. Funded Status -2 STDEV Event**	-	-	-	-	-	-

**(Current Est. WC Funded Status = 160%)*

RVK 2020 Capital Market Assumptions - Risk metrics

Expected Arithmetic Return/Risk Ratio	0.67	0.65	-0.02	0.77	0.75	-0.02
Expected Sharpe Ratio (RF = 2.25%)	0.41	0.41	-0.01	0.43	0.43	-
RVK Expected Eq Beta (LCUS = 1)	0.48	0.51	+0.03	0.34	0.36	+0.02
RVK Liquidity Metric (T-Bills = 100)	65	65	-	71	71	-

Monte Carlo Analysis

1st Percentile 1 Year Nominal Return	-20.04	-21.94	-1.90	-16.17	-16.93	-0.76
50th Percentile 10 Year Nominal Return	5.62	5.79	+0.17	5.04	5.13	+0.09

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Summary of Asset Allocation Recommendations
Pool A and Workers' Compensation

ASSET CLASS	POOL A					WORKERS' COMPENSATION		
	CURRENT	ALT #1	+/-	ALT #2	+/-	CURRENT	ALT #1	+/-
Broad US Equity	7.5	7.5	-	7.5	-	8.0	8.0	-
Small Cap US Equity	1.0	1.0	-	1.0	-	2.0	2.0	-
Broad International Equity	7.5	7.5	-	9.5	+2.0	10.0	12.5	+2.5
Preferred Stock	7.0	7.0	-	9.0	+2.0	-	-	-
MLPs	5.0	5.0	-	5.0	-	4.5	4.5	-
Private Equity	-	-	-	-	-	-	-	-
Core Real Estate	-	4.0	+4.0	4.0	+4.0	4.5	4.5	-
Non-Core Real Estate	8.0	4.0	-4.0	4.0	-4.0	4.0	4.0	-
Hedge Funds	-	-	-	-	-	-	-	-
US Agg Fixed Income	49.0	49.0	-	49.0	-	-	-	-
WC Liability Hedging Fixed Income*	-	-	-	-	-	62.0	62.0	-
Bank Loans	10.0	10.0	-	11.0	+1.0	-	-	-
Custom Emerging Markets Debt	-	-	-	-	-	5.0	2.5	-2.5
Cash Equivalents	5.0	5.0	-	-	-5.0	-	-	-
Total	100.0	100.0	-	100.0	-	100.0	100.0	-

*Consists of 58% Long Duration Fixed Income and 42% US Agg Fixed Income with an estimated duration of 11.6 years.

Asset Class Composition - Asset classes defined by their primary category

Fixed Income & Cash	64	64	-	60	-4	67	64.5	-3
Public Equity & Alternatives	36	36	-	40	+4	33	35.5	+3

Thematic Composition - Asset classes defined by their primary investment objective

Capital Appreciation	31	27	-4	31	-	29	29	-
Capital Preservation	54	54	-	49	-5	62	62	-
Alpha	0	0	-	0	-	0	0	-
Inflation	15	19	+4	20	+5	9	9	-

RVK 2020 Capital Market Assumptions - Return, standard deviation, and yield

Expected Return (Arithmetic)	4.68	4.60	-0.08	4.80	+0.12	4.60	4.68	+0.08
Expected Risk (Standard Deviation)	5.83	5.69	-0.14	6.23	+0.40	7.01	7.11	+0.10
Expected Return (Compound)	4.52	4.45	-0.07	4.62	+0.10	4.37	4.44	+0.07
Est. Yield (03/19/20)	4.73	4.71	-0.03	5.06	+0.33	4.05	3.97	-0.08

Liability-Driven Risk Metrics - Applicable to Workers' Compensation only

Expected Risk (Surplus Volatility)	-	-	-	-	-	6.37	6.64	+0.27
Est. Interest Hedge Ratio	-	-	-	-	-	103%	101%	-2%
Est. Funded Status -2 STDEV Event**	-	-	-	-	-	140%	139%	-1%

**(Current Est. WC Funded Status = 160%)

RVK 2020 Capital Market Assumptions - Risk metrics

Expected Arithmetic Return/Risk Ratio	0.80	0.81	+0.01	0.77	-0.03	0.66	0.66	-
Expected Sharpe Ratio (RF = 2.25%)	0.42	0.41	-	0.41	-0.01	0.33	0.34	+0.01
RVK Expected Eq Beta (LCUS = 1)	0.29	0.28	-0.01	0.31	+0.02	0.29	0.30	+0.01
RVK Liquidity Metric (T-Bills = 100)	77	78	+1	77	-	79	80	+1

Monte Carlo Analysis

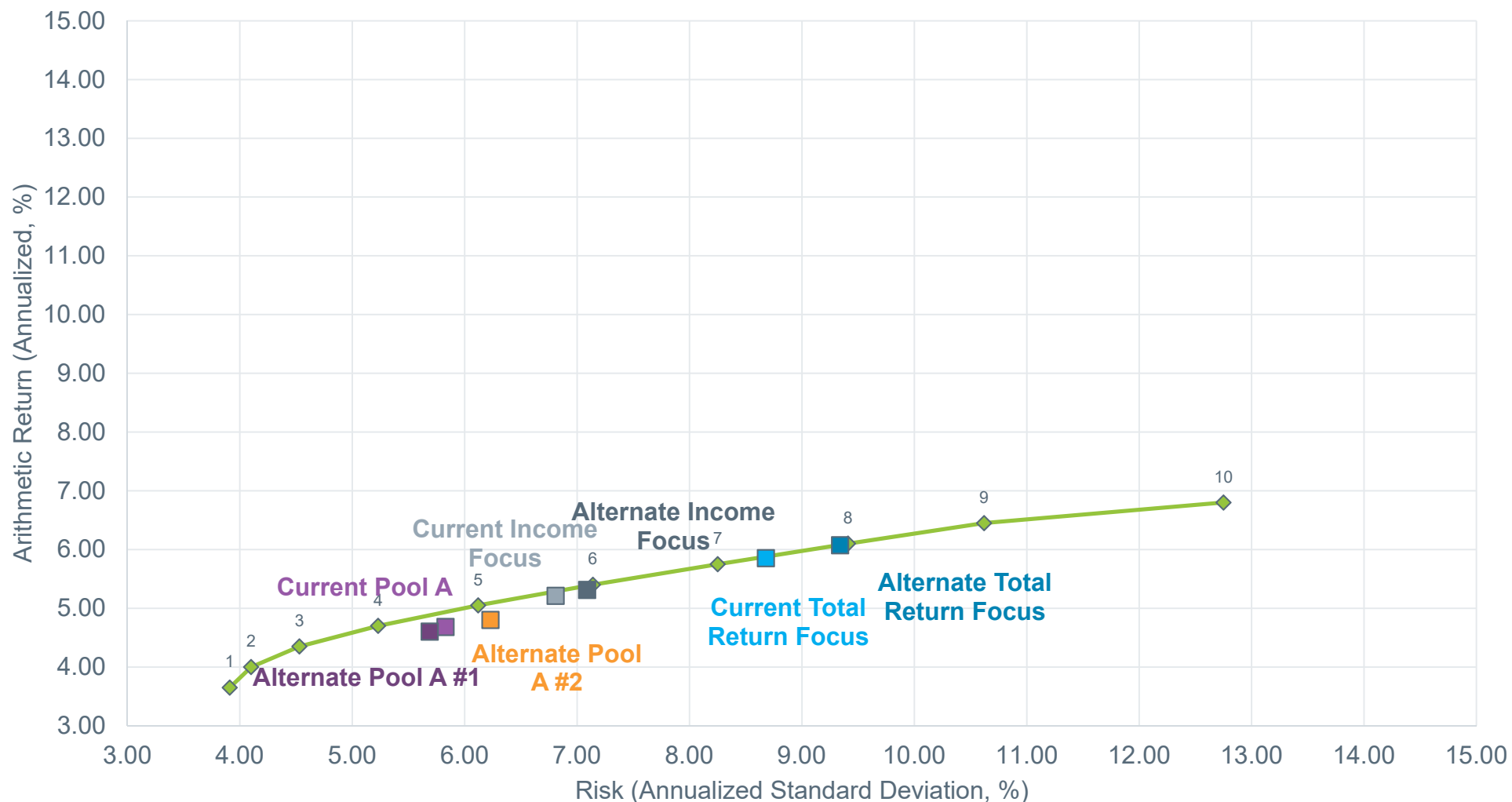|								
1st Percentile 1 Year Nominal Return	-12.19	-12.09	+0.10	-13.54	-1.35	-14.06	-14.20	-0.14
50th Percentile 10 Year Nominal Return	4.64	4.56	-0.08	4.75	+0.11	4.41	4.49	+0.08

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Efficient Frontier: Return & Standard Deviation

The figure below illustrates relationship between risk and return. The line connecting the points represents the optimal portfolios subject to the given constraints for the Total Return Focus portfolio and is known as the "efficient frontier".

- Other allocations may not fall exactly on the efficient frontier line due to strategic asset allocation differences, such as the Income Focus and Pool A inclusion of preferred stock and exclusion of private equity and hedge funds.
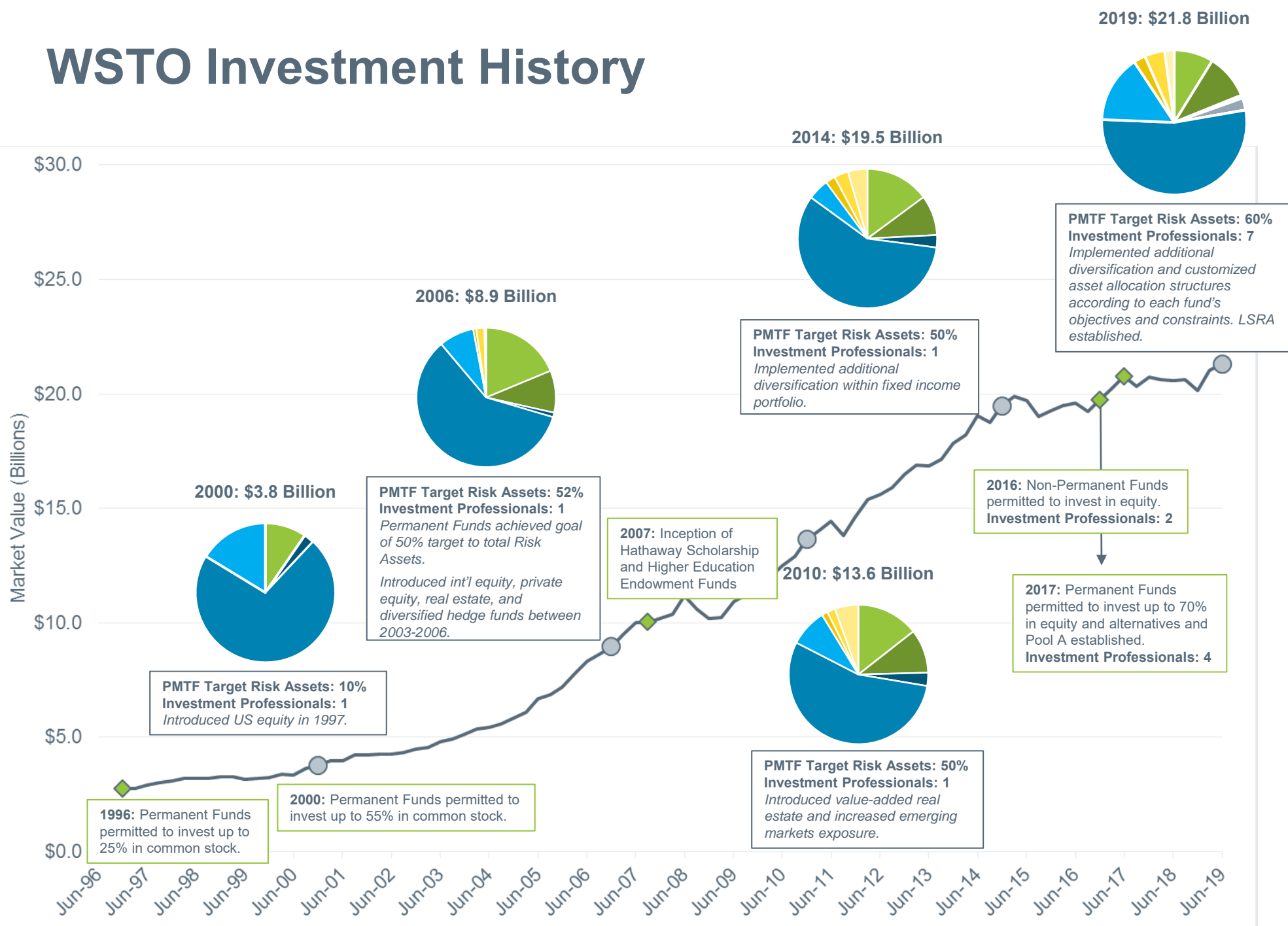
Appendices

Individual Investment Pool Characteristics

WSTO Investment History

2014: $19.5 Billion

2006: $8.9 Billion

2000: $3.8 Billion

2010: $13.6 Billion

Market Value (Billions) — Y-axis: $30.0, $25.0, $20.0, $15.0, $10.0, $5.0, $0.0

X-axis: Jun-96, Jun-97, Jun-98, Jun-99, Jun-00, Jun-01, Jun-02, Jun-03, Jun-04, Jun-05, Jun-06, Jun-07, Jun-08, Jun-09, Jun-10, Jun-11, Jun-12, Jun-13, Jun-14, Jun-15, Jun-16, Jun-17, Jun-18, Jun-19

PMTF Target Risk Assets: 60%
Investment Professionals: 7
Implemented additional diversification and customized asset allocation structures according to each fund's objectives and constraints. LSRA established.

PMTF Target Risk Assets: 50%
Investment Professionals: 1
Implemented additional diversification within fixed income portfolio.

PMTF Target Risk Assets: 52%
Investment Professionals: 1
Permanent Funds achieved goal of 50% target to total Risk Assets.
Introduced int'l equity, private equity, real estate, and diversified hedge funds between 2003-2006.

2007: Inception of Hathaway Scholarship and Higher Education Endowment Funds

2016: Non-Permanent Funds permitted to invest in equity.
Investment Professionals: 2

2017: Permanent Funds permitted to invest up to 70% in equity and alternatives and Pool A established.
Investment Professionals: 4

PMTF Target Risk Assets: 10%
Investment Professionals: 1
Introduced US equity in 1997.

1996: Permanent Funds permitted to invest up to 25% in common stock.

2000: Permanent Funds permitted to invest up to 55% in common stock.

PMTF Target Risk Assets: 50%
Investment Professionals: 1
Introduced value-added real estate and increased emerging markets exposure.

Pie charts and market values reflect the Total Fund as of June 30, 2019. Pie chart key: Green = Public Equity, Blue = Fixed Income & Cash, Yellow = Alternatives, Grey = Mixed Assets. Market values include Public Purpose Investments. PMTF Target Risk Assets include public equity, mixed assets, and alternatives. Convertibles were reclassified as mixed assets in 2017 and are included in the 2018 total allocation. Current targets to Risk Assets are Total Return Focus Perm. Funds: 60%, Income Focus Perm. Funds: 44%, Workers' Comp: 38%, Pool A: 36%, SAP: 0%, LSRA: 87.5% (Long-Term Reserve only)

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Summary of 2019 Asset Allocation Enhancements

Total Return Focus
- ☑ Increase Broad US Equity (+1%), Broad International Equity (+1%), MLPs (+1%), Non-Core Real Estate (+1%), and Bank Loans (+1%)
- ☑ Eliminate TIPS (-5%)

Income Focus
- ☑ Increase Broad International Equity (+1%), Preferred Stock (+1%), MLPs (+1%), and Non-Core Real Estate (+1%)
- ☑ Decrease Core Real Estate (-4%)

Pool A
- ☑ Increase Preferred Stock (+5%) and Non-Core Real Estate (+8%)
- ☑ Eliminate TIPS (-8%) and Emerging Markets Debt (-5%)

Workers Compensation
- ☑ Transition fixed income (currently core and long duration) to custom liability hedging mandate
- ☑ Remainder of portfolio allocated in same proportion as Total Return Focus (excluding Hedge Funds and Private Equity)

LSRA (Assets formerly within State Agency Pool)
- ☑ 3 separate reserves:
  - ☑ Short term (Low Duration Fixed Income)
  - ☑ Intermediate term (Core Fixed Income)
  - ☑ Long term (allocated in same proportion as Total Return Focus, excluding Private Equity, Real Estate, and Fixed Income).

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Overview of Investment Funds

Permanent Funds

A maximum of 70% of the total book value of permanent funds may be invested in equities and alternative investments

- Long-Term Total Return Focus
    - Permanent Mineral Trust Fund
    - Permanent Land Fund
    - University Permanent Land Fund
    - Hathaway Scholarship Fund
- Income Focus
    - Common School Permanent Land Fund
    - Higher Education Endowment Fund
- Workers' Compensation Fund (reclassified as Permanent Fund in Q4 2015)

Non-Permanent Funds

- Pool A Investment Account (Formerly the Tobacco Settlement Trust)
    - *Per the recent amendment to Wyoming Constitution Article 16 Section 6, can now invest in public equity and alternative investments*
- State Agency Pool
    - *Restricted by statutes from any investments in equities*
- LSRA
    - New Investment Fund (Formerly a part of State Agency Pool)

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Permanent Funds – Total Return Focus

Permanent Mineral Trust Fund, Permanent Land Fund, University Permanent Land Fund, and Hathaway Scholarship Fund

Combined Assets (12/31/19):	$8,323 million
Fund Horizon:	Permanent Fund (Perpetual)
Primary Investment Goal:	Preserve long-term purchasing power after spending and inflation, while providing stable income for distributions
Investment Constraints:	• The corpus must be held inviolate and cannot be spent • Only income and net capital gains can be spent (realized losses can become problematic in this regard) • Maximum of 70% of the total book value of permanent funds may be invested in equities and alternative investments (has been increased several times beginning with the initial allowance to invest in equities in 1996)
Spending Policy:	**Permanent Mineral Trust Fund:** 5% of the trailing 5-year average market value, with 2.5% guaranteed to the General Fund. - FY 2023: 4.75% of the trailing 5-year average market value - FY 2024 and thereafter: 4.5% of the trailing 5-year average market value - Amounts must be sourced from investment income (interest and dividends) and realized capital gains. - Earnings in excess of the spending policy are appropriated to the reserve account. Reserve account balance must exceed 150% of the current fiscal year's spending policy before transferring any excess funds to the corpus. **Hathaway Scholarship Fund:** The amount necessary to fully fund scholarships awarded under W.S. 21-16-1301 *et seq*. - Amounts must be sourced from investment income (interest and dividends) and realized capital gains. - Earnings in excess of the spending policy are appropriated from the Hathaway expenditure account to the Hathaway Fund reserve account. Reserve account balance must exceed $12 million or an amount equal to 4.5% of the previous 5-year average market value before transferring any excess funds to the corpus.
Other Considerations:	Avoid a high correlation with mineral prices

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Permanent Funds – Income Focus
Common School Permanent Land Fund and Higher Education Endowment Fund

Combined Assets (12/31/19):	$3,727 million
Fund Horizon:	Permanent Fund (Perpetual)
Primary Investment Goal:	Provide sufficient income to meet guaranteed spending levels, while preserving long-term purchasing power after spending and inflation
Investment Constraints:	• The corpus must be held inviolate and cannot be spent • Only income and net capital gains can be spent (realized losses can become problematic in this regard) • Maximum of 70% of the total book value of permanent funds may be invested in equities and alternative investments (has been increased several times beginning with the initial allowance to invest in equities in 1996)
Spending Policy:	**Common School Permanent Land Fund:** 5% of trailing 5-year average market value, with the full spending policy amount guaranteed to the General Fund. - FY 2025: 4.75% of the trailing 5-year average market value - FY 2026 and thereafter: 4.5% of the trailing 5-year average market value - Amounts must be sourced from investment income (interest and dividends) and realized capital gains. - Earnings in excess of the spending policy are appropriated to the reserve account. Reserve account balance must exceed 150% of the current fiscal year's spending policy before transferring any excess funds to the corpus. **Higher Education Endowment Fund:** 4.75% of trailing 5-year average market value of the fund, calculated on the first day of the fiscal year. - Amounts must be sourced from investment income (interest and dividends) and realized capital gains. - Earnings in excess of the spending policy are appropriated to the reserve account. Reserve account balance must exceed 150% of the current fiscal year's spending policy before transferring any excess funds to the corpus.
Other Considerations:	Avoid a high correlation with mineral prices.

The spending policy for Higher Education prior to FY 2019 was 5% of trailing 5-year average market value of the fund.

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State Agency Pool

Total Assets (12/31/19):	$5,456 million
Fund Horizon:	Non-Permanent Fund
Primary Investment Goal:	Stability assuring that appropriated funds remain to the greatest extend possible intact for their intended purposes. SAP is intended to be moderately liquid. • SAP is one of two pools holding a diverse array of individual funds ranging from agency budgets to reserve accounts.
Investment Constraints:	• This fund dispenses income and capital gains. • Cannot invest in equities or alternative investments
Spending Policy:	Investment income (interest, dividends, and capital gains) is deposited as prescribed by statute.

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Legislative Stabilization Reserve Account (LSRA)

Total Assets (12/31/19):	$1,831 million
Fund Horizon:	Non-Permanent Fund
Primary Investment Goal:	To obtain the highest possible return while seeking to preserve the balance of the account necessary to address potential budget shortfalls or a structural budget deficit.
Investment Constraints:	• This fund dispenses income and capital gains. • LSRA will be invested in 3 different pools, as detailed below • To the extent funds are available and prior to making any other investments, $500 million shall be invested in the short-term reserve.
Implementation:	• 3 separate pools: Long-Term (capital appreciation assets), Intermediate-Term (intermediate duration/core fixed income), Short-Term (low duration fixed income). • **Long-term reserve allocation is intended to be constructed similar to the Total Return Focus portfolios, less fixed income, private equity, and real estate.**

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Workers' Compensation Fund

Total Assets (12/31/19):	$2,229 million
Fund Horizon:	Permanent Fund (Perpetual)
Primary Investment Goal:	To provide for a return that assures the Fund will be self-funding or nearly self-funding in order to substantially reduce or eliminate the need for employer contributions.
Funded Status	160%
Duration of Liabilities	11.6 years
Investment Constraints:	• Maximum of 70% of the total book value of permanent funds may be invested in equities and alternative investments (has been increased several times beginning with the initial allowance to invest in equities in 1996). • This fund retains income and capital gains.
Spending Policy:	The exact cash level shall be determined by the Staff of the Wyoming Department of Workforce Services and dependent on the liquidity needs of the Fund. Those cash estimates shall be presented to the State Treasurer's Office on an annual basis.

Funded Status and Duration of liabilities are as of the most recent report (September 2019).

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Pool A Investment Account
(Formerly Tobacco Settlement Fund)

Total Assets (12/31/19):	$204 million
Fund Horizon:	Non-Permanent Fund
Primary Investment Goal:	Stability and return on investment. Pool A is intended to be moderately liquid and safely invested, but also be invested for return and growth. • Pool A is one of two pools holding a diverse array of individual funds from agency budgets to reserve accounts.
Investment Constraints:	• This fund dispenses income and capital gains. • Maximum of 60% of the total book value of Pool A may be invested in equities and alternative investments.
Spending Policy:	Investment income (interest, dividends, and capital gains) is deposited as prescribed by statute.

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Capital Market Assumptions

Themes for 2020 Capital Market Assumptions

- Past and future inflation levels are studied and considered given market conditions, break-even indications, sovereign intervention, and inflation component pricing behavior. *2020 assumption is for a 2.25% long-term expected increase (a 0.25% decrease from 2019 assumption).*

- Mean reversion is considered for asset classes demonstrating strong recent returns and pricing environments. *Public equity return assumptions were decreased.*

- Return decomposition models are run and examined in light of current and possible future market conditions.

- Yield history, current environment, and prospective environments are considered. *US fixed income return assumptions were decreased given the decline in yields.*

- Alternative asset classes are examined for impact from underlying asset classes. *Hedge fund assumptions reflect underlying exposure to asset class trends including equity and fixed income, along with structural characteristics.*

Asset Class	Return Expectation	Rationale
US Equity	⬇	Valuations Remain Expensive
Non-US Equity	⬇	Low Growth Outlook
Fixed Income	⬇	Yields Declining

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Capital Markets Line: 2009 vs. 2019

Capital Markets Line: 2009 Assumptions

Capital Markets Line: 2019 Assumptions

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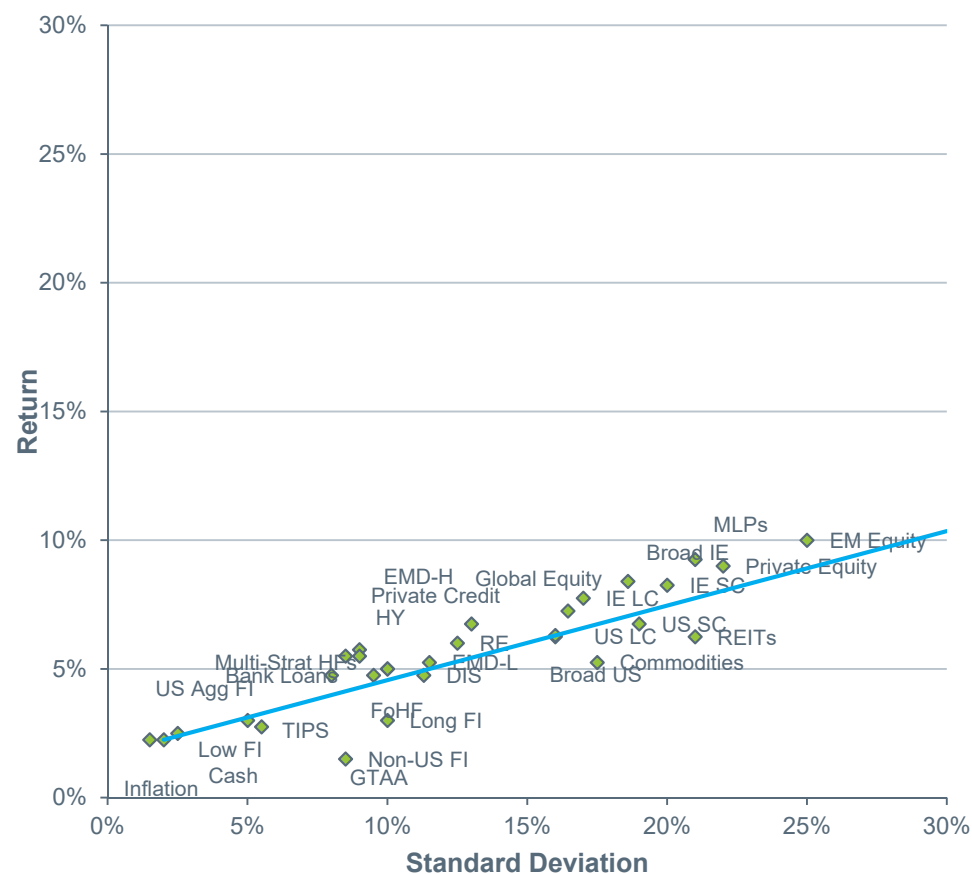
RVK 2020 Capital Market Assumptions

Asset Class	2020			
	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Return / Risk Ratio
Large/Mid Cap US Equity	5.07%	16.00%	6.25%	0.39
Small Cap US Equity	5.10%	19.00%	6.75%	0.36
Broad US Equity	5.12%	16.00%	6.30%	0.39
Dev'd Large/Mid Cap Int'l Equity	6.43%	17.00%	7.75%	0.46
Emerging Markets Equity	7.26%	25.00%	10.00%	0.40
Broad International Equity	6.84%	18.60%	8.40%	0.45
Preferred Stock	3.94%	15.00%	5.00%	0.33
MLPs	7.29%	21.00%	9.25%	0.44
Low Duration Fixed Income	2.47%	2.50%	2.50%	1.00
US Aggregate Fixed Income	2.88%	5.00%	3.00%	0.60
Long Duration Fixed Income	2.52%	10.00%	3.00%	0.30
Bank Loans	4.45%	8.00%	4.75%	0.59
Custom EMD	4.56%	9.67%	5.00%	0.52
EMD (Local)	4.63%	11.50%	5.25%	0.46
EMD (Hard)	4.53%	10.00%	5.00%	0.50
EMD (Corp)	4.32%	9.50%	4.75%	0.50
Core Real Estate	5.27%	12.50%	6.00%	0.48
Non-Core Real Estate	5.73%	22.50%	8.00%	0.36
Custom Hedge Funds	4.79%	8.35%	5.13%	0.61
Private Equity	6.85%	22.00%	9.00%	0.41
Commodities	3.82%	17.50%	5.25%	0.30
Cash Equivalents	2.23%	2.00%	2.25%	1.13
US Inflation	2.24%	1.50%	2.25%	1.50

Blue highlighted cells indicate values are being calculated base on a roll up of underlying asset classes.
Broad US Equity is a combination of 93.4% Large/Mid Cap US Equity and 6.6% Small Cap US Equity.
Broad International equity is a combination of 64.0% Dev'd Large/Mid Cap Int'l Equity, 10.7% Dev'd Small Cap Int'l Equity, and 25.3% Emerging Markets Equity.
Custom Hedge Funds is a combination of 50.0% Diversified Hedge Fund of Funds and 50.0% Multi-Strategy Hedge Funds.

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RVK 2020 Correlation Matrix

Interrelationship of Various Asset Class Pairings

	Lg/Mid Cap US Equity	Small Cap US Equity	Broad US Equity	Emerging Markets Equity	Broad Intl Equity	US Agg FI	TIPS	Preferred Stock	Bank Loans	Core Real Estate	Non-Core Real Estate	Infra-structure	MLPs	Private Equity	US Inflation	Cash Equiv.	China A Shares	Custom HFs	Custom EMD	WC Liability Hedging FI
Large/Mid Cap US Equity	1.00																			
Small Cap US Equity	0.84	1.00																		
Broad US Equity	0.99	0.89	1.00																	
Emerging Markets Equity	0.72	0.67	0.73	1.00																
Broad Intl Equity	0.82	0.75	0.83	0.88	1.00															
US Agg FI	0.16	0.05	0.14	0.00	0.00	1.00														
TIPS	0.01	-0.03	0.02	0.16	0.13	0.78	1.00													
Preferred Stock	0.52	0.45	0.52	0.51	0.55	0.26	0.27	1.00												
Bank Loans	0.45	0.45	0.47	0.45	0.52	-0.05	0.14	0.33	1.00											
Core Real Estate	0.22	0.18	0.22	0.21	0.30	-0.08	0.11	0.25	0.21	1.00										
Non-Core Real Estate	0.19	0.14	0.18	0.17	0.22	-0.06	0.02	0.04	0.16	0.69	1.00									
Infrastructure	0.75	0.65	0.76	0.81	0.89	0.24	0.34	0.57	0.54	0.37	0.30	1.00								
MLPs	0.43	0.43	0.45	0.44	0.46	0.03	0.14	0.43	0.47	0.18	0.12	0.56	1.00							
Private Equity	0.74	0.74	0.76	0.62	0.74	-0.29	-0.15	0.38	0.59	0.35	0.27	0.67	0.41	1.00						
US Inflation	0.02	0.01	0.01	0.07	0.08	-0.11	0.07	-0.03	0.34	0.19	0.06	0.09	0.18	0.17	1.00					
Cash Equiv.	0.04	0.01	0.03	-0.07	-0.05	0.28	0.09	-0.10	-0.04	0.02	0.01	0.04	0.05	0.02	0.38	1.00				
China A Shares	0.38	0.35	0.39	0.51	0.44	-0.09	0.02	0.20	0.28	-0.23	-0.26	0.33	0.33	0.26	0.00	-0.04	1.00			
Custom HFs	0.61	0.64	0.64	0.71	0.75	0.09	0.17	0.44	0.62	0.24	0.25	0.72	0.49	0.74	0.18	0.13	0.48	1.00		
Custom EMD	0.57	0.46	0.57	0.77	0.75	0.52	0.58	0.48	0.49	0.19	0.14	0.77	0.41	0.39	0.06	0.00	0.28	0.60	1.00	
WC Liability Hedging FI	0.11	0.05	0.14	0.01	0.00	0.97	0.75	0.25	-0.06	-0.06	-0.05	0.24	-0.01	-0.34	-0.09	0.19	-0.10	0.08	0.47	1.00

Correlation greater than 0.50
Correlation between 0.00 and 0.50
Correlation less than 0.00

RVK

US Fixed Income Valuations

Current Yield vs. Forward Returns

Trendline at 12/31/2019 = 2.69% Nominal Return (0.44% Real)

Chart: 10-Year Forward Barclays US Aggregate Bond Index Returns (Annualized) vs. Barclays US Aggregate Bond Index YTW (Annualized)

Forward 10-Year Return:
1976-2009 Correlation: 93%
Dec 2019 YTW: 2.31%
Dec 2019 Trendline: 2.69%

$y = 0.9521x + 0.0049$
$R^2 = 0.8565$

Legend:
- 1976-1979
- 1980-1989
- 1990-1999
- 2000-2009
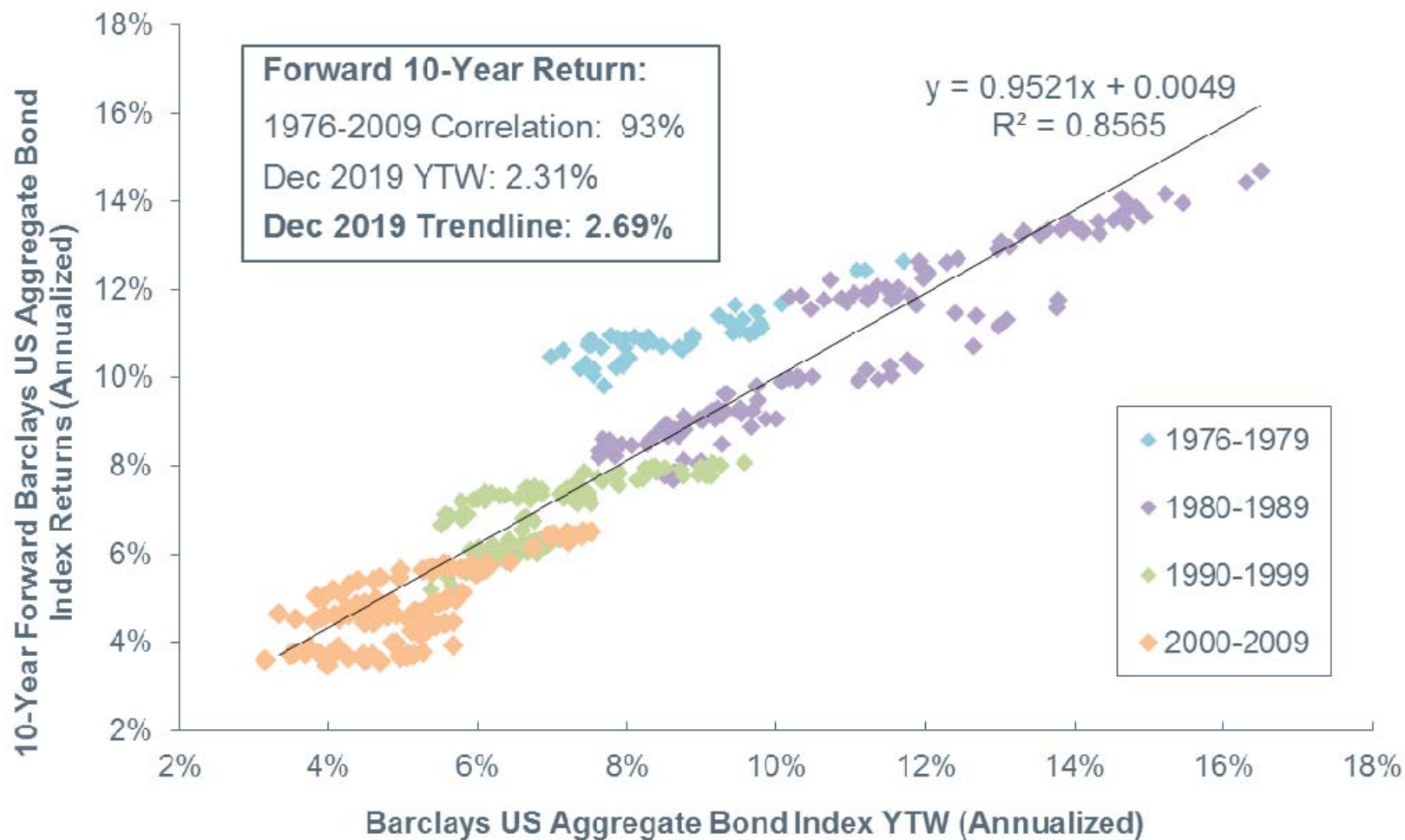
Trendline = 0.9521x + 0.0049

RVK

US Equity Valuations

Shiller P/E vs. Forward Returns

Trendline at 12/31/2019 = 0.62% Real Return (2.87% Real)

Forward 10-Year Real Return:
1926 - 2019: Correlation: -63.4%
Dec 2019 CAPE Ratio: 30.77
Trendline 10-Year Real Return: 0.62%

Legend:
- 1926-1929
- 1930-1949
- 1950-1969
- 1970-1989
- 1990-2009

$y = -0.0047x + 0.1508$
$R^2 = 0.4014$

Y-axis: 10-Year Forward S&P 500 Real Returns (Annualized, %)
X-axis: Shiller S&P 500 P/E Ratio (Normalized Real 10-Year)

Trendline = -0.0047x + 0.1508
R² = 0.4014

Estimated Asset Class Yields

Asset Class	Mar-2020 Yield (%)*	Dec-2019 Yield (%)	3-Month Adjustment	Dec-2018 Yield (%)	1.25 Year Adjustment
Broad US Equity	2.51	1.78	+0.73	2.11	+0.40
Small Cap US Equity	2.27	1.46	+0.81	1.67	+0.60
Broad International Equity	4.26	3.03	+1.23	3.46	+0.80
Preferred Stock	7.55	4.77	+2.78	5.85	+1.70
MLPs	18.80	8.83	+9.97	8.88	+9.92
US Aggregate Fixed Income	2.31	2.32	-0.01	3.28	-0.97
Long Duration Fixed Income	3.32	3.08	+0.24	4.07	-0.75
LH Fixed Income (WC)	2.90	2.76	+0.14	3.74	-0.84
Bank Loans	12.35	6.35	+6.00	8.07	+4.28
Custom EMD	7.44	4.95	+2.49	6.36	+1.08
Core Real Estate	3.91	3.91	--	4.31	-0.40
Non-Core Real Estate	4.54	4.54	--	5.46	-0.92
Custom Hedge Funds	--	--	--	--	--
Private Equity	--	--	--	--	--
Cash Equivalents	0.04	1.51	-1.47	2.38	-2.34

*As of March 19, 2020.
Estimated asset class yields are benchmark specific, with the exception of preferred stock and real estate which are specific to Wyoming's current managers.
Fixed income yields are yield to maturity.

RVK

Asset Class Return/Risk Efficiency

Asset Class	Return/Risk Ratio (2020 Assumptions)	Actual Return/Risk Ratio (15 Years)	Difference
Broad US Equity	0.39	0.62	-0.23
Small Cap US Equity	0.36	0.43	-0.07
Broad International Equity	0.45	0.29	+0.16
Emerging Markets Equity	0.40	0.35	+0.05
Preferred Stock	0.33	0.28	+0.05
MLPs	0.44	0.33	+0.11
US Aggregate Fixed Income	0.60	1.29	-0.69
Long Duration Fixed Income	0.30	0.72	-0.42
Bank Loans	0.59	0.51	+0.08
Custom EMD	0.52	0.63	-0.11
Core Real Estate	0.48	0.93	-0.45
Non-Core Real Estate	0.36	1.63	-1.27
Custom Hedge Funds	0.61	0.60	+0.01
Private Equity	0.40	1.59	-1.19
Cash Equivalents	1.13	1.64	-0.51

Actual risk/return ratios are based on index performance as of December 31, 2019 (with the exception of Private Equity, based on September 30, 2019).

RVK

Asset Allocation Modeling
Permanent Funds: Total Return Focus
-Permanent Mineral Trust Fund

-Permanent Land Fund

-University Permanent Land Fund

-Hathaway Scholarship Fund

Efficient Allocations: Total Return Focus

	Min	Max	1	2	3	4	5	6	7	8	9	10	Current Total Return Focus	Alternate Total Return Focus
Broad US Equity	0	50	0	0	0	2	4	6	8	10	13	18	11	11
Small Cap US Equity	0	10	0	0	0	0	1	2	2	3	3	4	3	3
Broad International Equity	0	50	0	0	0	3	7	12	16	19	24	34	14	18
MLPs	0	6	0	2	5	6	6	6	6	6	6	6	5.5	5.5
Private Equity	0	8	4	6	8	8	8	8	8	8	8	8	8	8
Core Real Estate	0	8	8	8	8	5	5	5	5	5	5	0	6	6
Non-Core Real Estate	0	5	0	2	2	5	5	5	5	5	5	0	5	5
Custom Hedge Funds	0	8	8	7	6	8	8	8	8	8	8	8	7.5	8.0
US Agg Fixed Income	0	100	75	69	64	57	50	42	33	25	17	11	29	25
Bank Loans	0	6	6	6	6	6	6	6	6	6	6	6	6	6
Custom Emerging Markets Debt	0	5	0	0	0	0	0	0	3	5	5	5	5	5
Total			100	100	100	100	100	100	100	100	100	100	100	100
Capital Appreciation			4	8	10	18	25	33	42	50	58	69	46	50
Capital Preservation			75	69	64	57	50	42	33	25	17	11	29	25
Alpha			8	7	6	8	8	8	8	8	8	8	8	8
Inflation			14	16	19	17	17	17	17	17	17	12	18	18
Expected Arithmetic Return			3.72	4.06	4.40	4.75	5.09	5.43	5.78	6.12	6.46	6.80	5.85	6.07
Expected Risk (Standard Deviation)			4.10	4.26	4.66	5.34	6.22	7.23	8.33	9.47	10.64	12.75	8.68	9.34
Expected Compound Return			3.64	3.97	4.30	4.61	4.91	5.18	5.45	5.70	5.93	6.05	5.50	5.66
Expected Return (Arithmetic)/Risk Ratio			0.91	0.95	0.94	0.89	0.82	0.75	0.69	0.65	0.61	0.53	0.67	0.65
RVK Expected Eq Beta (LCUS Eq = 1)			0.12	0.16	0.20	0.25	0.32	0.39	0.45	0.52	0.59	0.72	0.48	0.51
RVK Liquidity Metric (T-Bills = 100)			72	68	67	66	66	67	66	66	66	74	65	65
Total Fixed Income & Cash			81	75	70	63	56	48	42	36	28	22	40	36
Estimated Yield (03/19/20)			2.79	3.11	3.56	3.79	3.87	3.97	4.20	4.37	4.47	4.49	4.22	4.30

Group constraints: (i) Broad US equity must be at least 80% of total US equity. (ii) Total US equity must be at least 40% of total public equity. (iii) Total equity (including MLPs, private equity, real estate, and hedge funds) must not exceed 70% of the total portfolio. (iv) Core real estate must be at least 50% of total real estate. (v) Total real estate must not exceed 10% of the total portfolio. Please see the Glossary for statistics descriptions.

RVK

Efficient Frontier: Total Return Focus

Expected Return & Risk
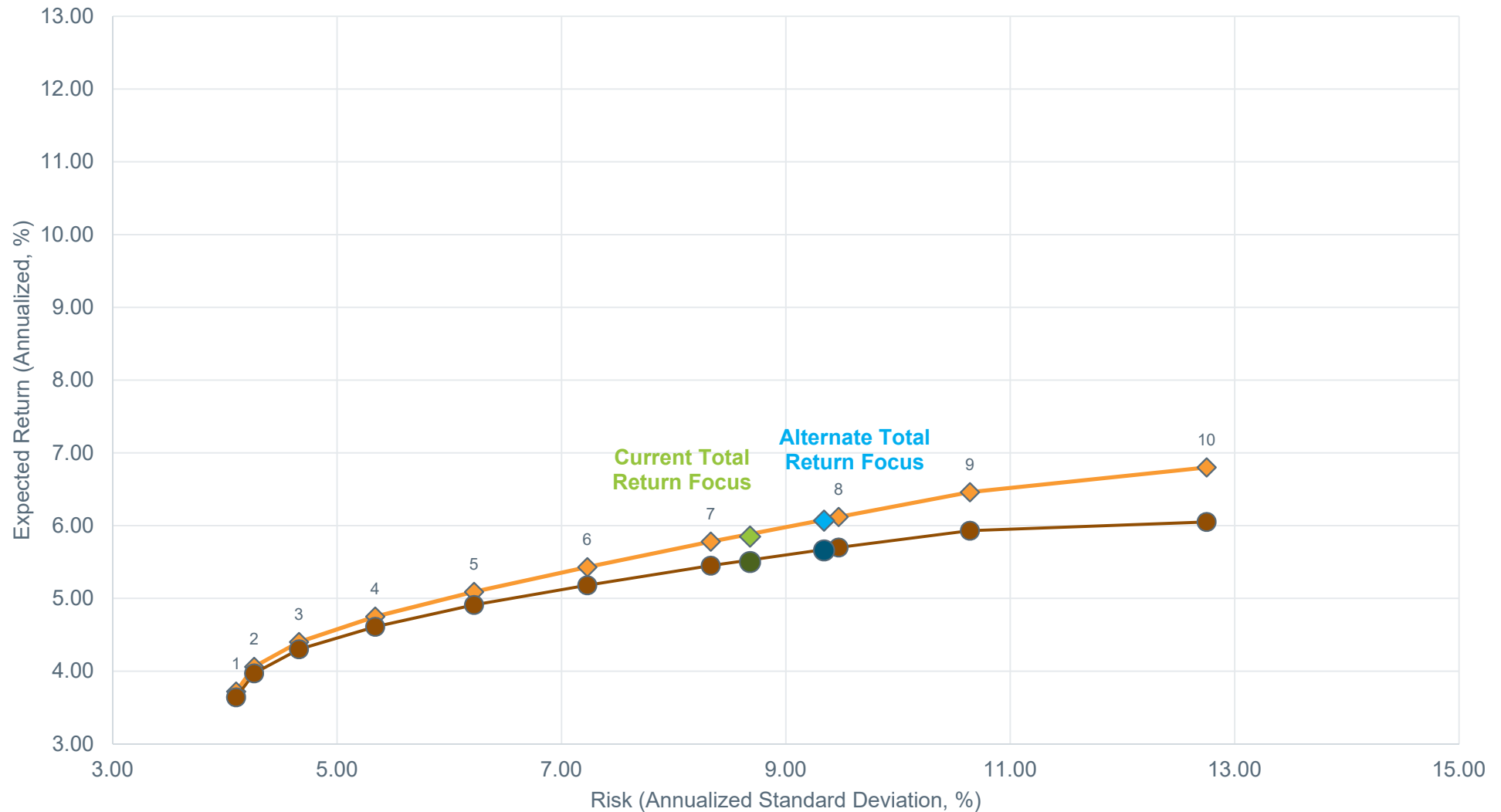
◆ = Arithmetic Return

● = Compound Return

Monte Carlo: Total Return Focus

The table below shows the expected nominal return by percentile for each portfolio on Frontier 1 for the 1, 3, 5, and 10 year periods.

1 Year	1	2	3	4	5	6	7	8	9	10	Current Total Return Focus	Alternate Total Return Focus
1st Percentile	-6.67	-7.42	-8.22	-9.59	-12.46	-15.75	-18.36	-21.98	-25.19	-30.40	-20.04	-21.94
5th Percentile	-3.50	-3.54	-3.64	-3.93	-4.91	-6.21	-7.76	-9.43	-11.02	-13.98	-8.53	-9.40
25th Percentile	0.73	1.07	1.27	1.40	1.28	1.11	0.78	0.36	-0.02	-1.13	0.56	0.37
50th Percentile	**3.74**	**4.20**	**4.60**	**5.02**	**5.37**	**5.74**	**6.15**	**6.51**	**6.91**	**7.26**	**6.21**	**6.47**
75th Percentile	6.79	7.27	7.78	8.35	9.29	10.34	11.42	12.58	13.72	15.44	11.87	12.49
95th Percentile	11.04	11.67	12.47	13.46	15.13	17.07	19.43	21.80	24.18	28.15	20.36	21.67
99th Percentile	13.90	14.52	15.54	16.83	19.21	22.07	25.24	28.71	32.12	38.49	26.69	28.37
3 Years												
5th Percentile	-0.47	-0.40	-0.36	-0.54	-1.09	-1.95	-2.99	-4.01	-5.12	-7.18	-3.48	-4.02
25th Percentile	1.96	2.23	2.50	2.72	2.71	2.64	2.47	2.30	2.07	1.46	2.33	2.28
50th Percentile	**3.71**	**4.09**	**4.43**	**4.81**	**5.20**	**5.53**	**5.87**	**6.17**	**6.42**	**6.57**	**5.93**	**6.11**
75th Percentile	5.41	5.87	6.34	6.84	7.52	8.25	9.00	9.82	10.64	11.70	9.27	9.73
95th Percentile	7.95	8.48	9.10	9.78	10.94	12.28	13.68	15.23	16.76	19.04	14.27	15.12
5 Years												
5th Percentile	0.39	0.49	0.57	0.48	0.00	-0.61	-1.37	-2.21	-3.03	-4.77	-1.84	-2.21
25th Percentile	2.34	2.64	2.91	3.11	3.20	3.19	3.12	2.97	2.82	2.26	2.99	2.96
50th Percentile	**3.68**	**4.05**	**4.40**	**4.75**	**5.08**	**5.38**	**5.71**	**5.97**	**6.24**	**6.50**	**5.74**	**5.93**
75th Percentile	5.05	5.46	5.88	6.35	6.94	7.54	8.18	8.88	9.54	10.39	8.41	8.81
95th Percentile	7.00	7.49	7.99	8.63	9.64	10.65	11.85	13.04	14.17	15.96	12.31	12.97
10 Years												
5th Percentile	1.34	1.52	1.65	1.66	1.39	1.02	0.51	-0.06	-0.67	-2.02	0.20	-0.08
25th Percentile	2.73	3.02	3.28	3.51	3.62	3.67	3.67	3.62	3.58	3.15	3.57	3.59
50th Percentile	**3.67**	**4.03**	**4.38**	**4.71**	**5.01**	**5.30**	**5.56**	**5.84**	**6.07**	**6.18**	**5.62**	**5.79**
75th Percentile	4.63	5.02	5.42	5.86	6.36	6.87	7.43	7.95	8.47	9.11	7.58	7.90
95th Percentile	5.98	6.40	6.92	7.47	8.23	9.08	9.98	10.91	11.85	13.24	10.32	10.86

*Investment Policy Guidelines: Total portfolio risk should be managed with a goal of avoiding annual losses greater than 22% with a 99% confidence level.

RVK

Monte Carlo: Total Return Focus

The table below shows the **percentage** chance of achieving or exceeding the given real return for each portfolio on Frontier 1 for the 1, 3, 5, and 10 year periods.

1 Year	1	2	3	4	5	6	7	8	9	10	Current Total Return Focus	Alternate Total Return Focus
Target 1%	55	58	60	62	64	64	64	64	64	62	64	64
Target 2%	46	49	52	55	57	58	59	60	60	59	59	60
Target 2.5%	41	45	48	51	54	56	57	58	58	58	57	58
Target 3%	37	41	45	48	50	53	54	56	56	56	55	55
Target 3.5%	33	37	40	44	47	50	52	53	54	55	52	53
Target 4%	29	33	37	40	44	47	49	51	52	53	49	50
3 Years												
Target 1%	57	61	65	69	70	70	70	69	69	67	69	69
Target 2%	42	48	53	57	60	62	62	63	63	62	62	63
Target 2.5%	35	41	46	50	54	57	58	59	60	59	58	59
Target 3%	28	33	39	44	49	52	54	56	57	57	55	56
Target 3.5%	22	27	32	38	43	47	50	52	54	54	51	52
Target 4%	17	21	27	32	38	42	46	49	51	52	47	49
5 Years												
Target 1%	59	65	69	73	74	74	74	73	72	70	73	73
Target 2%	39	46	53	58	62	63	65	65	65	64	64	65
Target 2.5%	30	37	44	50	54	57	59	61	62	61	59	60
Target 3%	22	29	35	41	47	51	54	56	57	57	54	56
Target 3.5%	16	21	27	34	40	45	49	51	53	54	49	51
Target 4%	11	15	20	27	34	39	44	47	49	51	45	46
10 Years												
Target 1%	61	69	75	78	79	79	79	78	77	74	78	78
Target 2%	34	43	52	59	64	66	68	68	68	66	67	68
Target 2.5%	23	31	40	48	54	58	61	62	63	62	61	62
Target 3%	14	20	29	37	44	50	54	56	58	58	54	56
Target 3.5%	7	12	19	27	35	42	47	50	53	53	47	49
Target 4%	4	7	11	18	26	34	39	44	47	49	40	43

RVK

Asset Allocation Modeling
Permanent Funds: Income Focus
-Common School Permanent Land Fund
-Higher Education Endowment Fund

Efficient Allocations: Income Focus

	Min	Max	1	2	3	4	5	6	7	8	9	10	Current Income Focus	Alternate Income Focus
Broad US Equity	0	30	0	1	1	3	5	7	9	11	13	20	8	8
Small Cap US Equity	0	10	0	0	0	1	2	2	3	4	4	7	2	2
Broad International Equity	0	30	0	1	2	5	10	14	18	23	26	30	10	12
Preferred Stock	0	10	0	0	0	0	0	0	0	0	0	0	3	3
MLPs	0	7	0	3	6	7	7	7	7	7	7	7	7	7
Core Real Estate	0	12	12	12	12	12	12	12	12	12	12	3	11	11
Non-Core Real Estate	0	3	0	1	3	3	3	3	3	3	3	3	3	3
US Agg Fixed Income	0	100	76	70	64	57	50	43	35	28	18	11	37	35
Bank Loans	0	12	12	12	12	12	12	12	12	12	12	12	12	12
Custom Emerging Markets Debt	0	7	0	0	0	0	0	0	0	0	5	7	7	7
Total			100	100	100	100	100	100	100	100	100	100	100	100
Capital Appreciation			0	3	7	12	19	27	34	41	51	67	33	35
Capital Preservation			76	70	64	57	50	43	35	28	18	11	37	35
Alpha			0	0	0	0	0	0	0	0	0	0	0	0
Inflation			24	27	30	31	31	31	31	31	31	22	30	30
Expected Arithmetic Return			3.58	3.91	4.24	4.57	4.91	5.24	5.57	5.90	6.24	6.57	5.21	5.31
Expected Risk (Standard Deviation)			4.11	4.23	4.55	5.06	5.80	6.69	7.69	8.76	9.87	11.73	6.81	7.09
Expected Compound Return			3.50	3.82	4.14	4.45	4.75	5.03	5.29	5.54	5.78	5.93	4.99	5.07
Expected Return (Arithmetic)/Risk Ratio			0.87	0.92	0.93	0.90	0.85	0.78	0.72	0.67	0.63	0.56	0.77	0.75
RVK Expected Eq Beta (LCUS Eq = 1)			0.09	0.12	0.16	0.21	0.28	0.34	0.41	0.48	0.54	0.66	0.34	0.36
RVK Liquidity Metric (T-Bills = 100)			74	73	72	72	72	73	73	73	72	78	71	71
Total Fixed Income & Cash			88	82	76	69	62	55	47	40	35	30	56	54
Estimated Yield (03/19/20)			3.71	4.25	4.80	5.03	5.16	5.21	5.27	5.40	5.72	5.77	5.64	5.68

Group constraints: (i) Broad US equity must be at least 75% of total US equity. (ii) Total US equity must be at least 40% of total public equity. (iii) Total equity (including preferred stock, MLPs, real estate, and hedge funds) must not exceed 70% of the total portfolio. (iv) Core real estate must be at least 50% of total real estate. Please see the Glossary for statistics descriptions.

RVK

Efficient Frontier: Income Focus
Expected Return & Risk
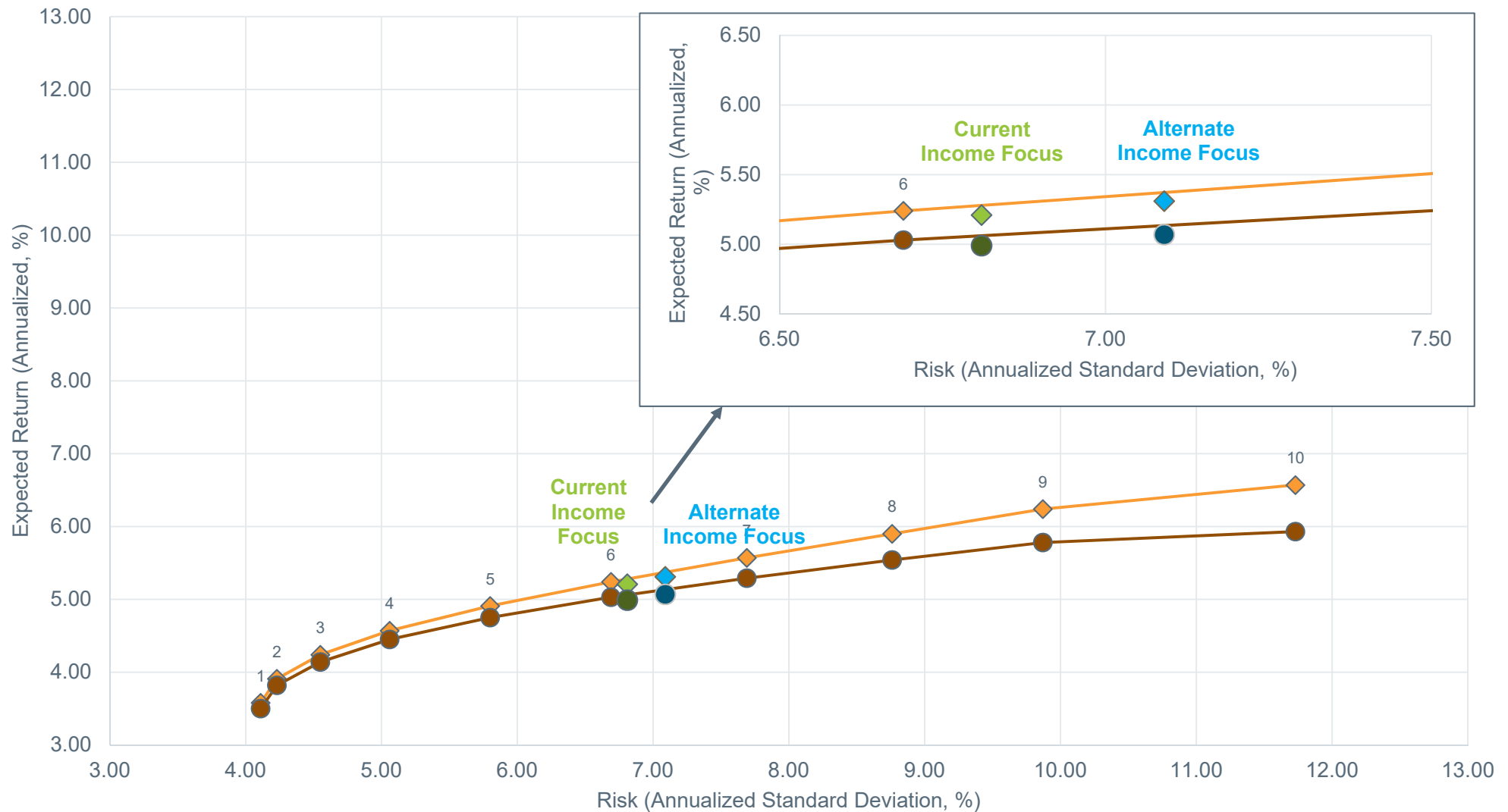
◆ *= Arithmetic Return*

● *= Compound Return*

Monte Carlo: Income Focus

The table below shows the expected nominal return by percentile for each portfolio on Frontier 1 for the 1, 3, 5, and 10 year periods.

1 Year	1	2	3	4	5	6	7	8	9	10	Current Income Focus	Alternate Income Focus
1st Percentile	-7.89	-8.28	-9.13	-10.42	-12.28	-14.75	-17.30	-20.07	-23.36	-27.68	-16.17	-16.93
5th Percentile	-4.08	-3.95	-3.99	-4.54	-5.44	-6.54	-7.88	-9.42	-11.21	-13.65	-6.89	-7.17
25th Percentile	0.59	0.94	1.18	1.32	1.23	1.02	0.64	0.31	-0.27	-1.09	0.94	0.87
50th Percentile	**3.68**	**4.08**	**4.46**	**4.83**	**5.15**	**5.54**	**5.86**	**6.22**	**6.58**	**6.86**	**5.56**	**5.65**
75th Percentile	6.72	7.14	7.66	8.34	9.19	10.15	11.18	12.26	13.52	15.07	10.29	10.59
95th Percentile	11.21	11.73	12.48	13.55	15.08	16.87	18.90	21.14	23.65	27.37	17.03	17.65
99th Percentile	14.45	14.86	15.60	16.80	19.12	21.76	24.66	27.85	31.40	36.54	22.14	22.98
3 Years												
5th Percentile	-0.94	-0.80	-0.80	-1.05	-1.63	-2.35	-3.21	-4.16	-5.29	-7.00	-2.71	-2.92
25th Percentile	1.68	2.00	2.25	2.45	2.46	2.41	2.29	2.13	1.87	1.29	2.33	2.30
50th Percentile	**3.47**	**3.82**	**4.18**	**4.56**	**4.90**	**5.21**	**5.56**	**5.88**	**6.16**	**6.34**	**5.20**	**5.31**
75th Percentile	5.26	5.64	6.10	6.60	7.28	7.97	8.71	9.45	10.25	11.25	8.00	8.23
95th Percentile	7.89	8.30	8.80	9.59	10.67	11.84	13.14	14.51	16.01	18.12	11.97	12.35
5 Years												
5th Percentile	-0.02	0.19	0.19	0.05	-0.41	-0.93	-1.64	-2.40	-3.41	-4.93	-1.19	-1.41
25th Percentile	2.05	2.34	2.63	2.80	2.87	2.88	2.82	2.74	2.59	2.12	2.76	2.78
50th Percentile	**3.50**	**3.83**	**4.17**	**4.48**	**4.81**	**5.14**	**5.43**	**5.70**	**6.00**	**6.20**	**5.15**	**5.25**
75th Percentile	4.86	5.25	5.68	6.15	6.71	7.32	7.93	8.57	9.24	9.95	7.35	7.53
95th Percentile	6.84	7.24	7.78	8.49	9.36	10.34	11.40	12.54	13.79	15.45	10.48	10.78
10 Years												
5th Percentile	0.96	1.18	1.33	1.28	1.07	0.74	0.31	-0.16	-0.83	-2.06	0.53	0.40
25th Percentile	2.46	2.77	3.02	3.25	3.35	3.41	3.44	3.41	3.30	2.96	3.31	3.33
50th Percentile	**3.48**	**3.82**	**4.14**	**4.46**	**4.77**	**5.07**	**5.34**	**5.58**	**5.80**	**5.96**	**5.04**	**5.13**
75th Percentile	4.48	4.83	5.22	5.66	6.16	6.66	7.17	7.69	8.22	8.78	6.68	6.83
95th Percentile	5.90	6.28	6.76	7.37	8.10	8.85	9.72	10.60	11.61	12.80	8.95	9.20

*Investment Policy Guidelines: Total portfolio risk should be managed with a goal of avoiding annual losses greater than 22% with a 99% confidence level.

RVK

Monte Carlo: Income Focus

The table below shows the **percentage** chance of achieving or exceeding the given real return for each portfolio on Frontier 1 for the 1, 3, 5, and 10 year periods.

1 Year	1	2	3	4	5	6	7	8	9	10	Current Income Focus	Alternate Income Focus
Target 1%	54	57	60	61	62	63	63	63	63	62	63	63
Target 2%	45	49	52	54	56	57	58	59	59	59	57	58
Target 2.5%	41	44	48	51	53	54	56	57	57	57	54	55
Target 3%	37	40	43	47	49	51	53	54	55	55	51	52
Target 3.5%	33	36	39	43	46	49	50	52	53	54	49	49
Target 4%	29	32	35	39	43	46	48	50	51	52	46	47
3 Years												
Target 1%	53	58	62	66	67	68	68	68	68	66	68	68
Target 2%	38	43	48	53	56	59	60	61	62	61	59	59
Target 2.5%	31	37	41	46	51	54	56	58	59	59	53	54
Target 3%	25	30	35	41	46	49	52	54	55	56	49	50
Target 3.5%	20	24	29	35	40	44	48	50	52	53	45	46
Target 4%	16	19	24	29	35	40	44	47	49	50	40	41
5 Years												
Target 1%	54	60	65	68	70	71	71	71	70	69	70	70
Target 2%	35	41	47	53	57	60	62	63	63	63	60	60
Target 2.5%	27	33	39	45	50	54	57	58	59	59	54	55
Target 3%	20	25	31	38	44	48	52	54	55	56	48	49
Target 3.5%	14	18	24	30	37	42	46	49	51	53	42	43
Target 4%	9	13	17	24	30	36	41	45	48	49	36	38
10 Years												
Target 1%	55	63	70	74	76	76	77	76	75	73	75	75
Target 2%	30	38	46	54	59	62	64	66	66	65	62	62
Target 2.5%	20	27	35	43	50	54	57	59	61	61	54	55
Target 3%	12	18	25	33	40	46	50	53	55	56	45	47
Target 3.5%	6	10	16	23	31	38	43	47	50	51	38	40
Target 4%	3	6	10	16	23	30	36	41	45	47	30	32

RVK

Asset Allocation Modeling
-Pool A

Efficient Allocations: Pool A

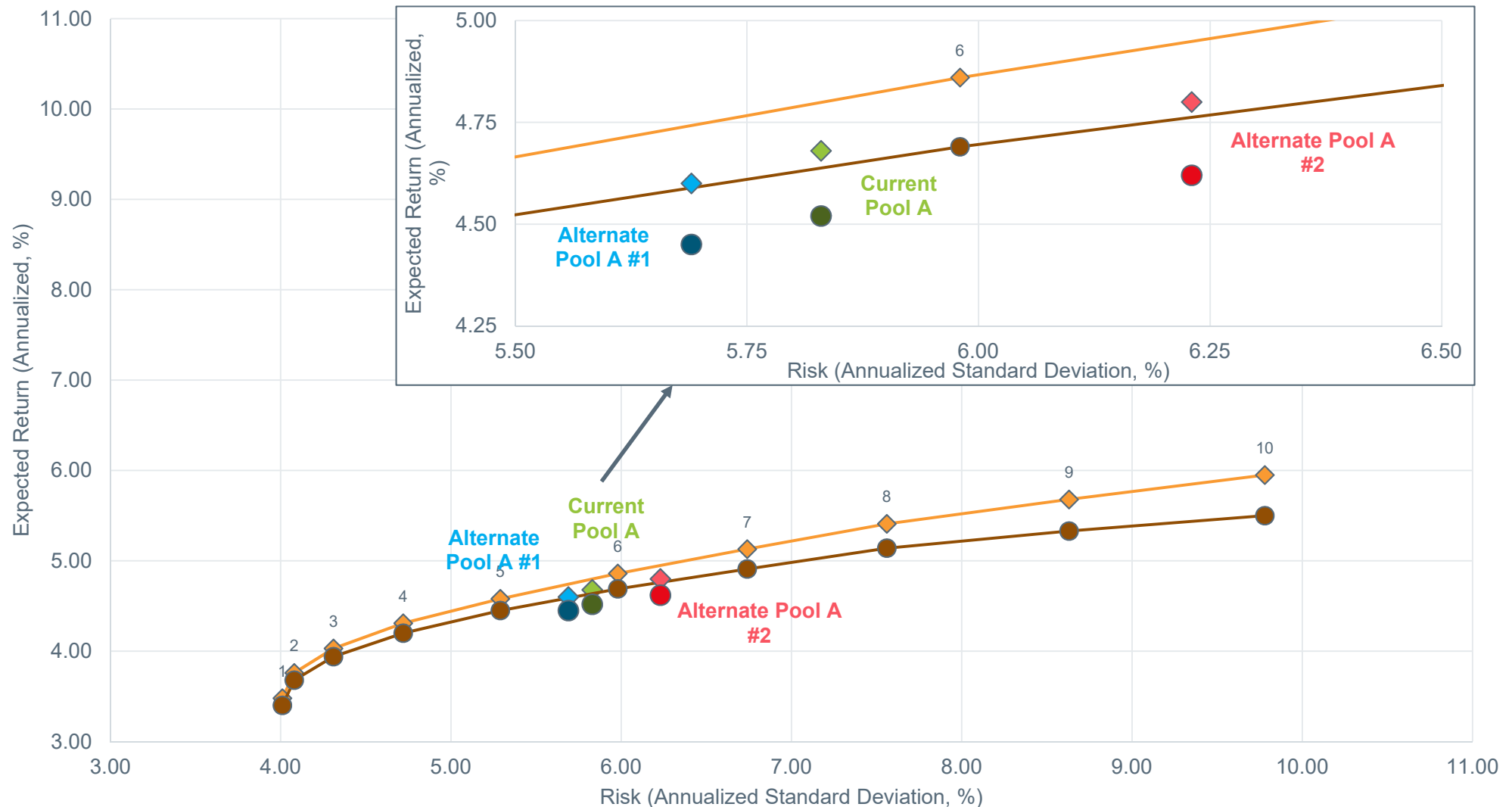|	Min	Max	1	2	3	4	5	6	7	8	9	10	Current Pool A	Alternate Pool A #1	Alternate Pool A #2
Broad US Equity	0	20	0	1	1	3	5	6	8	10	15	20	7.5	7.5	7.5
Small Cap US Equity	0	5	0	0	0	1	2	2	3	3	5	5	1	1	1
Broad International Equity	0	20	1	2	3	6	10	13	16	20	20	20	7.5	7.5	9.5
Preferred Stock	0	7	0	0	0	0	0	0	0	0	2	7	7	7	9
MLPs	0	5	1	3	5	5	5	5	5	5	5	5	5	5	5
Core Real Estate	0	7	7	7	7	6	5	5	5	5	5	5	0	4	4
Non-Core Real Estate	0	8	1	3	3	4	5	5	5	5	5	5	8	4	4
US Agg Fixed Income	0	100	75	70	65	60	54	53	48	42	33	23	49	49	49
Bank Loans	0	10	10	10	10	10	10	10	10	10	10	10	10	10	11
Cash Equivalents	0	5	5	5	5	5	5	1	0	0	0	0	5	5	0
Total			100	100	100	100	100	100	100	100	100	100	100	100	100
Capital Appreciation			2	5	8	14	21	26	32	38	47	57	31	27	31
Capital Preservation			80	75	70	65	59	54	48	42	33	23	54	54	49
Alpha			0	0	0	0	0	0	0	0	0	0	0	0	0
Inflation			18	20	22	21	20	20	20	20	20	20	15	19	20
Expected Arithmetic Return			**3.48**	**3.76**	**4.03**	**4.31**	**4.58**	**4.86**	**5.13**	**5.41**	**5.68**	**5.95**	**4.68**	**4.60**	**4.80**
Expected Risk (Standard Deviation)			**4.01**	**4.08**	**4.31**	**4.72**	**5.29**	**5.98**	**6.74**	**7.56**	**8.63**	**9.78**	**5.83**	**5.69**	**6.23**
Expected Compound Return			**3.40**	**3.68**	**3.94**	**4.20**	**4.45**	**4.69**	**4.91**	**5.14**	**5.33**	**5.50**	**4.52**	**4.45**	**4.62**
Expected Return (Arithmetic)/Risk Ratio			0.87	0.92	0.94	0.91	0.87	0.81	0.76	0.72	0.66	0.61	0.80	0.81	0.77
RVK Expected Eq Beta (LCUS Eq = 1)			0.09	0.12	0.15	0.20	0.25	0.30	0.36	0.41	0.49	0.56	0.29	0.28	0.31
RVK Liquidity Metric (T-Bills = 100)			77	76	76	76	76	76	76	76	77	78	77	78	77
Total Fixed Income & Cash			90	85	80	75	69	64	58	52	43	33	64	64	60
Estimated Yield (03/19/20)			3.52	3.94	4.24	4.33	4.44	4.57	4.66	4.74	4.85	5.12	4.73	4.71	5.06

Group constraints: (i) Broad US equity must be at least 75% of total US equity. (ii) Total US equity must be at least 40% of total public equity. (iii) Total equity (including MLPs, and real estate) must not exceed 70% of the total portfolio. (iv) Core real estate must be at least 50% of total real estate. (v) Total real estate must not exceed 10% of the total portfolio. Please see the Glossary for statistics descriptions.

RVK

Efficient Frontier: Pool A
Expected Return & Risk
◆ *= Arithmetic Return*
● *= Compound Return*

RVK

Monte Carlo: Pool A

The table below shows the expected nominal return by percentile for each portfolio on Frontier 1 for the 1, 3, 5, and 10 year periods.

1 Year	1	2	3	4	5	6	7	8	9	10	Current Pool A	Alternate Pool A #1	Alternate Pool A #2
1st Percentile	-6.49	-6.74	-7.27	-8.54	-10.29	-12.25	-14.41	-16.81	-19.99	-24.41	-12.19	-12.09	-13.54
5th Percentile	-3.27	-3.19	-3.31	-3.81	-4.34	-5.36	-6.38	-7.46	-9.20	-10.93	-4.94	-4.98	-5.61
25th Percentile	0.60	0.93	1.15	1.22	1.15	0.99	0.79	0.49	0.04	-0.27	1.33	1.23	1.22
50th Percentile	**3.41**	**3.74**	**4.06**	**4.42**	**4.82**	**5.11**	**5.46**	**5.75**	**6.05**	**6.38**	**5.03**	**4.95**	**5.22**
75th Percentile	6.34	6.67	7.08	7.62	8.22	8.98	9.80	10.62	11.81	13.00	8.53	8.43	9.00
95th Percentile	10.65	10.95	11.49	12.32	13.47	14.89	16.55	18.34	20.59	22.76	13.66	13.64	14.66
99th Percentile	13.79	14.03	14.81	15.75	17.21	19.43	21.46	24.04	27.05	29.98	17.43	17.46	18.71
3 Years													
5th Percentile	-0.65	-0.51	-0.48	-0.66	-0.99	-1.53	-2.15	-2.81	-3.85	-4.98	-1.27	-1.40	-1.76
25th Percentile	1.77	2.06	2.26	2.38	2.45	2.39	2.37	2.29	2.07	1.85	2.52	2.43	2.46
50th Percentile	**3.46**	**3.76**	**4.08**	**4.39**	**4.69**	**4.98**	**5.21**	**5.45**	**5.70**	**5.96**	**4.88**	**4.78**	**5.00**
75th Percentile	5.14	5.44	5.82	6.25	6.76	7.35	7.93	8.51	9.23	9.95	7.00	6.94	7.37
95th Percentile	7.48	7.82	8.26	8.89	9.68	10.67	11.72	12.81	14.25	15.54	9.93	9.86	10.51
5 Years													
5th Percentile	0.23	0.43	0.49	0.37	0.17	-0.22	-0.67	-1.18	-2.05	-3.07	-0.07	-0.17	-0.52
25th Percentile	2.13	2.41	2.65	2.80	2.87	2.91	2.91	2.86	2.69	2.55	2.95	2.86	2.89
50th Percentile	**3.45**	**3.74**	**4.02**	**4.30**	**4.58**	**4.82**	**5.10**	**5.33**	**5.55**	**5.78**	**4.72**	**4.65**	**4.86**
75th Percentile	4.72	5.02	5.37	5.77	6.22	6.71	7.21	7.73	8.31	8.93	6.39	6.33	6.70
95th Percentile	6.53	6.86	7.25	7.82	8.47	9.28	10.15	11.06	12.14	13.23	8.70	8.62	9.17
10 Years													
5th Percentile	1.19	1.42	1.58	1.53	1.38	1.19	0.90	0.60	-0.06	-0.89	1.20	1.10	0.89
25th Percentile	2.50	2.76	2.99	3.16	3.29	3.38	3.45	3.50	3.42	3.32	3.35	3.28	3.33
50th Percentile	**3.41**	**3.71**	**3.99**	**4.27**	**4.52**	**4.77**	**5.01**	**5.23**	**5.43**	**5.65**	**4.64**	**4.56**	**4.75**
75th Percentile	4.32	4.62	4.93	5.31	5.70	6.12	6.52	6.94	7.41	7.89	5.87	5.79	6.11
95th Percentile	5.65	5.95	6.31	6.78	7.36	8.01	8.68	9.42	10.26	11.12	7.57	7.47	7.94

*Investment Policy Guidelines: Total portfolio risk should be managed with a goal of avoiding annual losses greater than 20% with a 99% confidence level.

RVK

Monte Carlo: Pool A

The table below shows the **percentage** chance of achieving or exceeding the given real return for each portfolio on Frontier 1 for the 1, 3, 5, and 10 year periods.

1 Year	1	2	3	4	5	6	7	8	9	10	Current Pool A	Alternate Pool A #1	Alternate Pool A #2
Target 0%	60	63	65	67	67	67	67	67	66	66	69	68	68
Target 1%	51	53	56	59	60	61	62	62	62	62	62	61	62
Target 1.5%	47	49	52	55	57	58	59	59	60	60	59	58	59
Target 2%	42	45	48	51	53	55	56	57	57	59	55	54	55
Target 3%	34	36	39	43	45	48	50	52	53	54	47	47	49
Target 4%	26	28	31	34	38	41	44	46	48	50	40	39	42
3 Years													
Target 0%	68	71	74	75	76	76	76	75	74	73	77	76	76
Target 1%	53	57	61	64	66	67	67	68	67	67	67	66	67
Target 1.5%	45	50	54	58	60	62	63	64	64	64	62	60	62
Target 2%	38	42	47	51	54	57	59	60	60	61	56	55	57
Target 3%	24	28	32	37	42	46	49	51	53	54	44	43	46
Target 4%	13	16	20	25	30	35	39	42	45	47	33	31	35
5 Years													
Target 0%	72	76	79	81	81	81	80	79	78	77	81	80	81
Target 1%	53	59	64	68	70	71	71	71	70	70	70	69	70
Target 1.5%	43	49	54	59	62	64	65	66	66	66	64	62	64
Target 2%	34	39	45	50	54	57	59	61	62	62	56	55	57
Target 3%	18	22	27	33	39	43	47	50	52	54	41	39	44
Target 4%	7	10	13	18	24	30	35	39	43	46	27	26	30
10 Years													
Target 0%	80	84	87	88	89	88	87	86	84	83	88	88	87
Target 1%	54	62	68	72	75	76	77	77	76	75	76	74	75
Target 1.5%	40	48	55	61	66	68	70	71	70	70	66	65	67
Target 2%	27	34	42	50	55	59	61	63	64	65	57	55	58
Target 3%	9	14	19	26	34	40	45	49	51	53	36	35	39
Target 4%	2	3	6	10	16	22	29	34	38	42	18	17	22

RVK

Asset Allocation Modeling

-Workers' Compensation Fund

Workers' Compensation Fund: Key Terms

Funded Status: the fair value of a Plan's assets divided by the projected benefit obligation. A fully funded Plan is one in which the fair value of the assets is enough to cover at least 100 percent of the projected benefits.

Duration of Liabilities: the sensitivity of Plan liabilities to a change in interest rates. A duration of 10 years implies that for every 1.00% change in interest rates, the liability would change by 10.00% in the inverse direction.

Surplus Volatility: the funded status volatility or tracking error of the investment return relative to the change in present value of the Plan liabilities.

Interest Hedge Ratio: the estimate of how well a Plan's investment portfolio is hedged against changes in interest rates – a primary driver of funded status movements. This is calculated by dividing the dollar-weighted values of both the Plan asset duration by the liability duration and multiplying by the estimated funded status. An estimated plan hedge ratio of zero indicates that the Plans' liabilities have not been hedged, whereas a value of one indicates fully hedged.

Estimated Funded Status – 2 STDEV Event: the estimated funded status of a Plan in one year assuming investment returns during that year are 2 standard deviations below the mean. The value assumes interest plus service costs are equal to expected return.

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Efficient Allocations: Workers' Compensation Fund
Expected Return and Surplus Volatility

	Min	Max	1	2	3	4	5	6	7	8	9	10	Current WC	Alternate WC
Broad US Equity	0	30	20	18	16	13	11	9	7	7	7	7	8	8
Small Cap US Equity	0	5	0	0	0	0	0	0	1	1	1	2	2	2
Broad International Equity	0	30	0	0	2	5	7	9	11	12	12	13	10	12.5
MLPs	0	5	3	5	5	5	5	5	5	5	5	5	4.5	4.5
Core Real Estate	0	5	5	5	5	5	5	5	5	5	5	5	4.5	4.5
Non-Core Real Estate	0	4	4	4	4	4	4	4	4	4	4	4	4	4
Custom Emerging Markets Debt	0	5	5	5	5	5	5	5	4	4	5	4	5	2.5
WC Liability Hedging Fixed Income	60	63	63	63	63	63	63	63	63	62	61	60	62	62
Total			100	100	100	100	100	100	100	100	100	100	100	100
Total Equity			32	32	32	32	32	32	33	34	35	36	33	36
Expected Equity Beta (LC US Eq = 1)			0.28	0.27	0.27	0.27	0.27	0.27	0.27	0.28	0.29	0.30	0.29	0.30
Expected Return (Arithmetic)			**4.31**	**4.36**	**4.41**	**4.46**	**4.51**	**4.56**	**4.61**	**4.66**	**4.71**	**4.75**	**4.60**	**4.68**
Risk (Surplus Volatility)			**5.85**	**5.86**	**5.93**	**5.99**	**6.08**	**6.17**	**6.30**	**6.48**	**6.65**	**6.83**	**6.37**	**6.64**
Expected Compound Return			**4.08**	**4.13**	**4.18**	**4.23**	**4.28**	**4.33**	**4.38**	**4.42**	**4.47**	**4.51**	**4.37**	**4.44**
Risk (Standard Deviation)			6.98	6.94	6.92	6.91	6.91	6.92	6.95	7.01	7.07	7.13	7.01	7.11
Est. Interest Hedge Ratio			105%	105%	105%	105%	105%	105%	104%	103%	101%	99%	103%	101%
Est. Funded Status -2 STDEV Event (Current = 160%)*			141%	141%	141%	141%	141%	140%	140%	139%	139%	138%	140%	139%
Total Fixed Income & Cash			68	68	68	68	68	68	67	66	66	64	67	64.5
Estimated Yield (03/19/20)			3.64	3.97	4.00	4.06	4.09	4.13	4.11	4.12	4.17	4.13	4.05	3.97

WC Liability Hedging Fixed Income consists of 58% Long Duration Fixed Income and 42% US Agg Fixed Income.

Group constraints: (i) Broad US equity must be at least 75% of total US equity. (ii) Total US equity must be at least 40% of total public equity. (iii) Total public equity (broad US, small cap US, and broad international equity) must not exceed % of the total portfolio. (iv) Core real estate must be at least 50% of total real estate. Please see the Glossary for statistics descriptions.
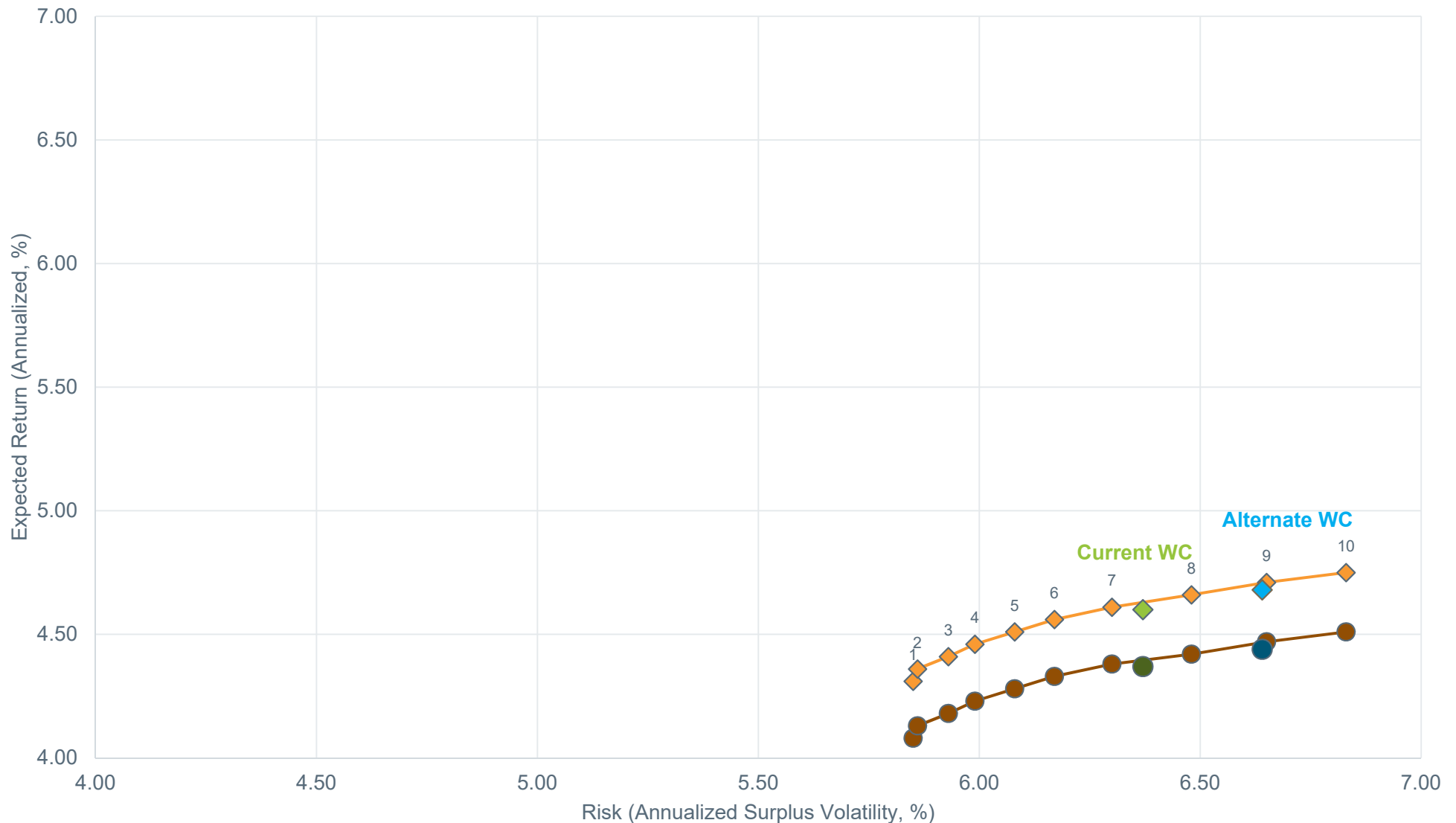
RVK

Efficient Frontier: Workers' Compensation Fund

Expected Return & Risk (Surplus Volatility)

◆ *= Arithmetic Return*

● *= Compound Return*

Monte Carlo: Workers' Compensation Fund

The table below shows the expected nominal return by percentile for each portfolio on Frontier 1 for the 1, 3, 5, and 10 year periods.

1 Year	1	2	3	4	5	6	7	8	9	10	Current WC	Alternate WC
1st Percentile	-13.83	-13.58	-13.65	-13.84	-14.17	-14.36	-14.67	-14.88	-15.35	-16.81	-14.06	-14.20
5th Percentile	-6.94	-6.92	-6.89	-6.98	-7.07	-7.14	-7.30	-7.34	-7.52	-8.79	-7.07	-7.21
25th Percentile	-0.04	0.02	0.08	0.09	0.15	0.18	0.16	0.12	0.09	-0.31	0.06	0.08
50th Percentile	**4.66**	**4.70**	**4.72**	**4.79**	**4.86**	**4.94**	**4.97**	**5.01**	**5.03**	**5.05**	**4.76**	**4.84**
75th Percentile	9.25	9.33	9.41	9.48	9.55	9.65	9.74	9.86	10.02	10.53	9.41	9.61
95th Percentile	16.28	16.30	16.39	16.53	16.64	16.76	17.01	17.23	17.48	18.56	16.47	16.76
99th Percentile	21.13	21.08	21.20	21.32	21.77	21.94	22.03	22.25	22.76	25.08	21.49	21.70
3 Years												
5th Percentile	-2.58	-2.60	-2.56	-2.59	-2.68	-2.71	-2.78	-2.86	-2.95	-3.53	-2.68	-2.75
25th Percentile	1.61	1.66	1.71	1.74	1.73	1.75	1.77	1.77	1.75	1.50	1.67	1.70
50th Percentile	**4.39**	**4.43**	**4.47**	**4.52**	**4.56**	**4.61**	**4.67**	**4.71**	**4.74**	**4.76**	**4.47**	**4.55**
75th Percentile	7.11	7.15	7.20	7.29	7.38	7.46	7.53	7.61	7.70	8.00	7.27	7.40
95th Percentile	10.95	11.00	11.04	11.18	11.28	11.41	11.52	11.63	11.78	12.51	11.17	11.36
5 Years												
5th Percentile	-1.05	-0.97	-0.95	-0.99	-1.02	-1.04	-1.12	-1.16	-1.22	-1.76	-1.05	-1.09
25th Percentile	2.15	2.20	2.26	2.29	2.31	2.31	2.33	2.35	2.36	2.17	2.22	2.27
50th Percentile	**4.32**	**4.37**	**4.43**	**4.49**	**4.54**	**4.59**	**4.62**	**4.67**	**4.72**	**4.72**	**4.43**	**4.50**
75th Percentile	6.43	6.47	6.53	6.60	6.68	6.75	6.81	6.89	6.97	7.16	6.56	6.68
95th Percentile	9.46	9.51	9.57	9.67	9.79	9.90	10.00	10.15	10.30	10.85	9.63	9.82
10 Years												
5th Percentile	0.42	0.47	0.52	0.50	0.47	0.46	0.44	0.44	0.40	-0.02	0.43	0.43
25th Percentile	2.75	2.80	2.85	2.89	2.91	2.93	2.95	2.96	2.98	2.80	2.84	2.89
50th Percentile	**4.30**	**4.36**	**4.41**	**4.46**	**4.50**	**4.54**	**4.59**	**4.62**	**4.66**	**4.65**	**4.41**	**4.49**
75th Percentile	5.81	5.85	5.91	5.97	6.03	6.09	6.15	6.21	6.29	6.46	5.93	6.04
95th Percentile	8.08	8.11	8.15	8.23	8.33	8.45	8.54	8.63	8.74	9.14	8.22	8.37

*Investment Policy Guidelines: Total portfolio risk should be managed with a goal of avoiding annual losses greater than 22% with a 99% confidence level.

RVK

Monte Carlo: Workers' Compensation Fund

The table below shows the **percentage** chance of achieving or exceeding the given real return for each portfolio on Frontier 1 for the 1, 3, 5, and 10 year periods.

1 Year	1	2	3	4	5	6	7	8	9	10	Current WC	Alternate WC
Target 0%	63	64	64	64	64	64	65	65	65	63	64	64
Target 2%	51	52	52	52	53	53	53	54	54	54	52	53
Target 2.5%	49	49	49	49	50	50	50	51	51	51	49	50
Target 3%	46	46	46	46	47	47	48	48	48	48	46	47
Target 3.5%	43	43	43	44	44	44	45	45	46	46	44	44
Target 4%	40	41	41	41	41	42	42	43	43	43	41	41
3 Years												
Target 0%	69	70	70	71	71	71	71	71	71	70	70	70
Target 2%	51	52	52	52	53	53	54	54	54	54	52	53
Target 2.5%	46	46	47	47	48	48	49	50	50	50	47	48
Target 3%	41	41	42	42	43	43	44	44	45	45	42	43
Target 3.5%	36	37	37	38	38	39	39	40	40	41	38	38
Target 4%	32	32	33	33	34	34	35	36	36	37	33	34
5 Years												
Target 0%	74	74	75	75	75	75	75	75	75	74	74	75
Target 2%	51	51	52	53	53	54	54	54	55	55	52	53
Target 2.5%	44	45	45	46	47	48	48	49	49	49	46	47
Target 3%	38	39	39	40	41	42	42	43	43	44	40	41
Target 3.5%	32	33	33	34	35	35	36	37	37	39	33	34
Target 4%	27	27	28	28	29	30	30	31	32	34	28	29
10 Years												
Target 0%	81	82	82	82	82	83	83	83	83	81	82	82
Target 2%	50	51	52	53	53	54	55	55	56	55	52	53
Target 2.5%	41	42	43	44	45	46	46	47	48	48	43	45
Target 3%	33	34	34	35	36	37	38	39	40	41	35	36
Target 3.5%	25	26	27	28	28	29	30	31	32	33	27	28
Target 4%	19	19	20	21	22	22	23	24	25	27	20	22

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Appendix

Capital Markets Assumptions

Philosophy

- Each year, RVK's general consulting and research teams collaborate to review the capital market environment and update long-term, forward-looking capital market (CM) expectations for each asset class utilized by our clients.

- The forecast horizon is for long-term periods, typically 10 years or more.

- The components we estimate include:
  - Return
  - Risk (volatility of returns)
  - Correlation (relationship of asset class returns with all other asset classes)

- Return assumptions are generally index-based and <u>assume no investment manager alpha</u>.

- Annual updates are typically gradual and incorporate historical performance, current valuations, as well as the overall economic environment.

Building Block Methodology

Approach: The sum of the building blocks equals expected return

Yield (Income)		Inflation Assumption		Real Growth		Valuation Change
	+		**+**		**+**	

Expected Return Building Blocks

For illustrative purposes only. While the above factors generally inform the direction and magnitude of the capital market assumptions, RVK also considers qualitative, triangulation, and other factors as needed, when arriving at final assumption values. Real Growth includes GDP and profit margin growth.

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Summary of Expected Return Methodology

Building Block Methodology

Cash Equivalents	Current yield
Fixed Income	Current yield + option-adjusted spread change
TIPS	Current real yield + inflation assumption
Public Equity	Current dividend yield + real GDP/earnings growth + inflation assumption + expected P/E change
Core Real Estate	Current yield + inflation assumption + valuation
Hedge Funds	Beta return + alpha return + risk-free return (cash assumption)
Commodities	Collateral return (cash assumption) + spot return (inflation assumption) + roll return

Build-Up/Spread Methodology

Non-Core Real Estate	Core real estate assumption + 2.00% return premium
Private Equity	US large/mid cap equity assumption + 2.75% return premium

While the above factors generally inform the direction and magnitude of the capital market assumptions, RVK also considers qualitative, triangulation, and other factors as needed, when arriving at final assumption values.

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What does it mean to get CM Assumptions *"right"*?

Relative accuracy is most important…

- **Relative Accuracy:** Assumptions capture the relative relationships between asset classes – particularly closely related ones.
  - Having some assumptions that are spot on and others that are far off will produce unbalanced and poorly diversified portfolios.

But "absolute" accuracy matters too—just not as much.

- **Absolute Accuracy:** Assumptions reflect the absolute values actually experienced in future long-term market environments.
  - Having CM assumptions that are too high or too low across the board can cause a Fund to believe it can spend more than it can afford or restrict spending more than necessary.

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Factors to keep in mind when evaluating assumptions…

- While excessively high capital market assumptions provide the hope of higher rates of expected return, this prospect may not actually materialize if the market environment does not support them and can often lead to suboptimal portfolio structures.

- A well-structured and executed investment program will be best positioned to benefit from the available market returns *regardless of the forecasts for total return*.

- Well-structured asset allocations (and the resulting outcomes) are largely produced by the relative accuracy of assumptions, not simply by forecasting higher absolute returns.

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Decomposition Models

$$\hat{R}_i = \frac{D}{P} + g + \Delta\left(\frac{P}{E}\right)$$

$\hat{R}_i$ = Expected Return

$\frac{D}{P}$ = Dividend Yield

g = Projected Earnings Growth

$\Delta\left(\frac{P}{E}\right)$ = Expected Change in Price/Earnings Ratio

Global Equity Summary Statistics

	Year-End Yield	RVK Inflation	GDP Growth	Total	Valuation Change	Total
Large/Mid Cap US Equity	1.82%	2.25%	2.05%	6.12%	-1.19%	4.93%
Small Cap US Equity	1.43%	2.25%	2.95%	6.63%	-0.55%	6.08%
Dev'd Large/Mid Cap Int'l Equity	3.37%	2.25%	2.10%	7.72%	-0.44%	7.28%
Dev'd Small Cap Int'l Equity	2.68%	2.25%	2.87%	7.80%	0.62%	8.42%
Emerging Markets Equity	2.64%	2.25%	3.76%	8.65%	0.13%	8.78%

GDP Growth includes profit margin growth.

Fixed Income Summary Statistics

	Yield to Worst (YTW)				Option-Adjusted Spread (OAS)				Duration			
	2018	2019	10-Yr Avg.	Hist. Avg.	2018	2019	10-Yr Avg.	Hist. Avg.	2018	2019	10-Yr Avg.	Hist. Avg.
Low Duration Fixed Income	2.75	1.71	1.19	5.48	0.22	0.11	0.22	0.31	1.90	1.87	1.90	1.75
Int. Duration Fixed Income	3.28	2.31	2.48	6.56	0.54	0.39	0.52	0.55	5.87	5.87	5.45	4.92
Int. Duration Gov't Fixed Income	2.54	1.68	1.40	5.66	0.00	0.00	0.00	0.00	3.75	3.77	3.74	3.23
Long Duration Fixed Income	4.06	3.08	4.03	7.32	1.13	0.79	1.09	1.04	14.97	15.81	14.56	10.73
TIPS	1.11	0.17	0.12	0.75	N/A	N/A	N/A	N/A	5.25	4.67	5.53	5.05
High Yield	7.95	5.19	6.67	8.95	5.26	3.36	4.81	5.48	3.96	3.05	4.05	4.43
Bank Loans	6.50	5.74	5.10	6.33	5.50	5.74	5.20	4.60	N/A	N/A	N/A	N/A
Emerging Markets Debt (Hard)	6.86	4.93	5.65	6.99	4.15	4.93	3.31	3.86	6.55	7.56	6.94	6.58
Emerging Markets Debt (Local)	6.46	5.22	6.38	6.68	3.94	5.22	4.80	4.27	5.13	5.41	4.82	4.54

Above 10-Yr Average	
Below 10-Yr Average	

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US Inflation & Cash Equivalents

Inflation & Cash Equivalents									
	2020			2019			One Year Adjustment (2020-2019)		
Asset Class	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)
US Inflation	2.24%	1.50%	2.25%	2.46%	3.00%	2.50%	-0.22%	-1.50%	-0.25%
Cash Equivalents	2.23%	2.00%	2.25%	2.96%	3.00%	3.00%	-0.73%	-1.00%	-0.75%

Market Expectations for Inflation

- US inflation assumption decreased 25 bps from previous year as inflation pressures remain at historically low levels.

- Cash assumption decreased given decline in cash yields.

As of December 31, 2019	5-Year	7-Year	10-Year	20-Year	30-Year
Treasury Yield	1.69%	1.83%	1.92%	2.25%	2.39%
TIPS Yield	0.01%	0.07%	0.15%	0.39%	0.58%
Implied Expected Inflation	1.68%	1.76%	1.77%	1.86%	1.81%

Source: US Department of the Treasury (2019).

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Fixed Income: US Aggregate

Fixed Income: US Aggregate									
	2020			2019			One Year Adjustment (2020-2019)		
Asset Class	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)
US Aggregate Fixed Income	2.88%	5.00%	3.00%	3.58%	6.00%	3.75%	-0.70%	-1.00%	-0.75%

Bloomberg US Aggregate Bond Index
Yield to Worst
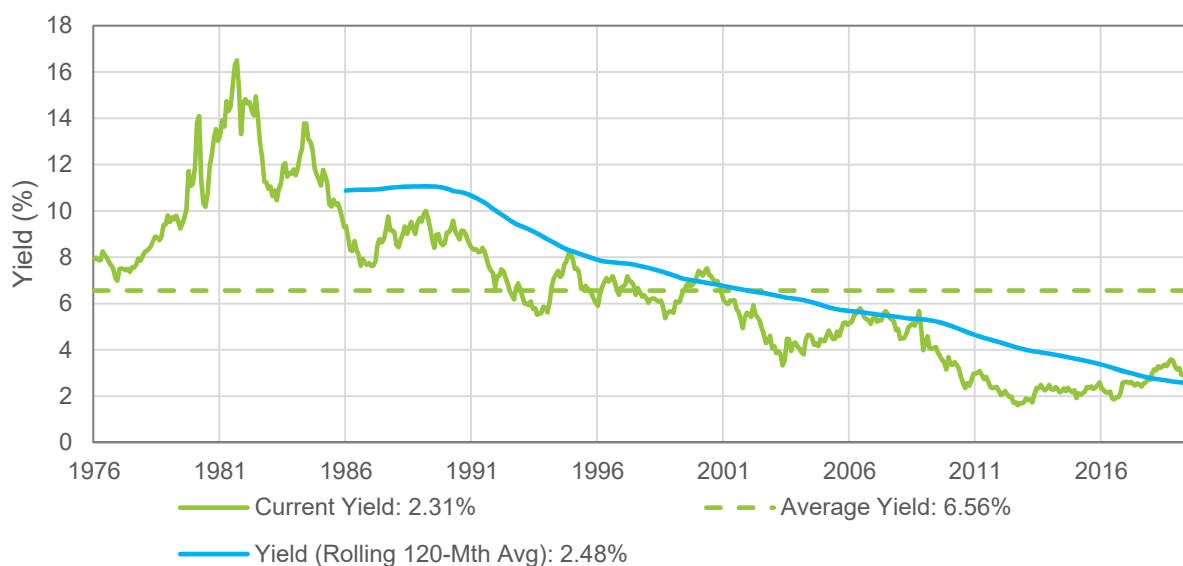
Current Yield: 2.31%   Average Yield: 6.56%

Yield (Rolling 120-Mth Avg): 2.48%

Average Yield to Worst is for the time period January 1976 through December 2019.
Averages are calculated based on monthly frequency.

- Decreased US Aggregate fixed income return assumption due to decrease in yields.

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Fixed Income: High Yield & Bank Loans

Asset Class	2020			2019			One Year Adjustment (2020-2019)		
	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)
High Yield	4.53%	10.00%	5.00%	4.95%	15.00%	6.00%	-0.43%	-5.00%	-1.00%
Bank Loans	4.45%	8.00%	4.75%	4.78%	10.00%	5.25%	-0.33%	-2.00%	-0.50%

Bloomberg US Corporate High Yield Index
Yield to Worst

Current Yield: 5.19%
Average Yield: 9.94%
Yield (Rolling 120-Mth Avg): 6.67%

Average Yield to Worst is for the time period January 1987 through December 2019.
Averages are calculated based on monthly frequency.

- Decreased high yield arithmetic return assumption by 1% due to declining yields and tightening HY spreads.

- Decreased bank loans arithmetic return assumption by 0.50% due to declining yields.

Source: Barclays Live (2019).

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Fixed Income: Emerging Markets Debt (LC, HC, Corp)

Fixed Income: Emerging Markets Debt (Local, Hard, Corp))									
	2020			**2019**			**One Year Adjustment (2020-2019)**		
Asset Class	**Nominal Return (Geo.)**	**Risk (StDev)**	**Nominal Return (Arith.)**	**Nominal Return (Geo.)**	**Risk (StDev)**	**Nominal Return (Arith.)**	**Nominal Return (Geo.)**	**Risk (StDev)**	**Nominal Return (Arith.)**
EMD (Local)	4.63%	11.50%	5.25%	5.02%	12.50%	5.75%	-0.39%	-1.00%	-0.50%
EMD (Hard)	4.53%	10.00%	5.00%	5.23%	10.50%	5.75%	-0.71%	-0.50%	-0.75%
EMD (Corp)	4.32%	9.50%	4.75%	--	--	--	--	--	--

JPM GBI-EM Global Diversified TR Index Yield to Worst

- Current Yield: 5.22%
- Average Yield: 6.68%
- Yield (Rolling 120-Mth Avg): 6.38%

JPM EMBI Global Diversified TR Index Yield to Worst

- Current Yield: 4.91%
- Average Yield: 7.65%
- Yield (Rolling 120-Mth Avg): 5.63%

JPM CEMBI Broad Diversified TR Index Yield to Worst

- Current Yield: 4.51%
- Average Yield: 6.08%
- Yield (Rolling 12-Month Average): 5.28%

Averages are calculated based on monthly frequency.

- Decreased return assumptions for emerging markets debt.
- Yields decreased while spreads increased.

Source: JP Morgan (2019).

Emerging Markets Debt
Growth of Market Capitalization in ($) Billions by EMD Index

- Options for investing in emerging markets debt has evolved from hard currency sovereign only mandates, to local currency sovereign, hard currency corporate debt, and mixed mandates. As of the end of 2019, each of these segments represents approximately one-third of total emerging market outstanding debt.


EM Local (JPM GBI EM Global Index) — $1,220
EM Hard Currency Corporate (JPM CEMBI Broad Index) — $1,042
EM Hard Currency Sovereigns (JPM EMBI Global) — $1,108

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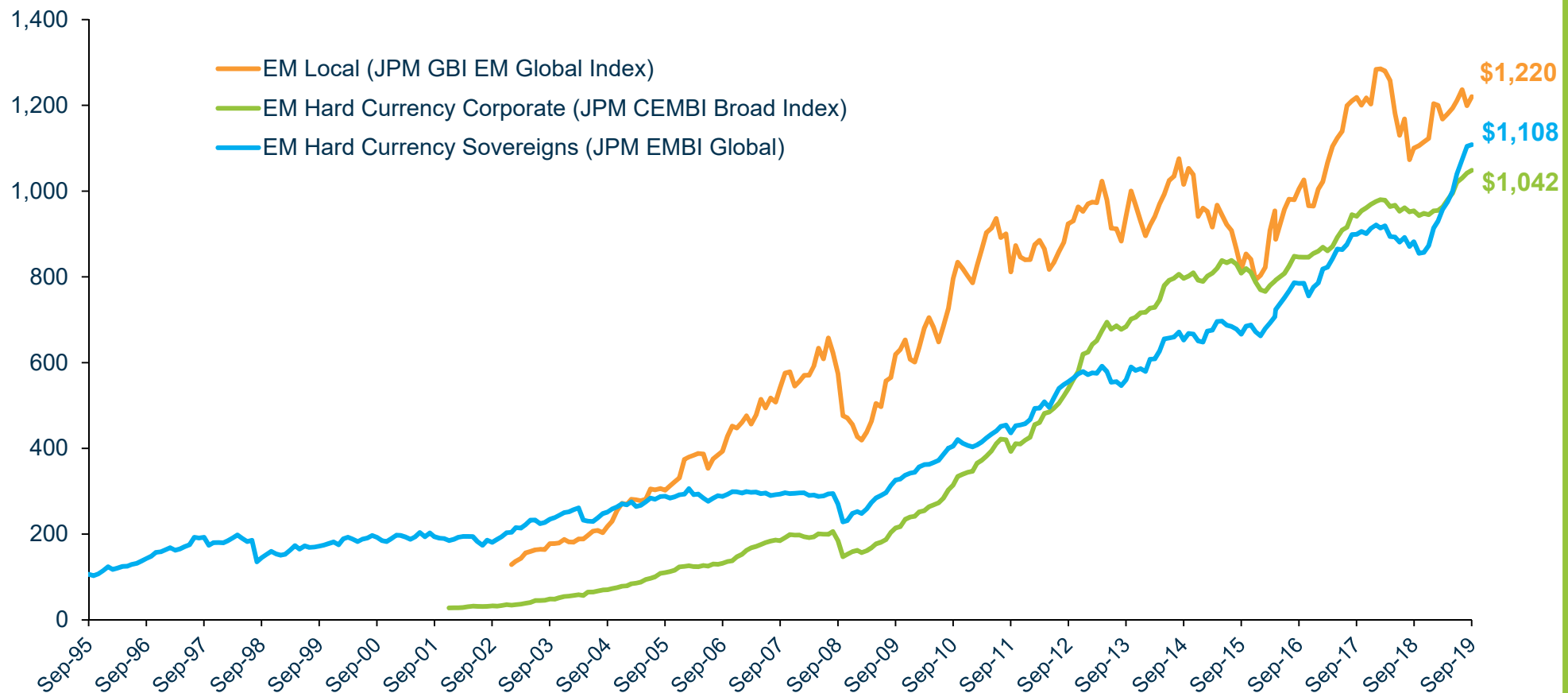
Fixed Income: Low Duration & Long Duration

Asset Class	2020			2019			One Year Adjustment (2020-2019)		
	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)
Low Duration Fixed Income	2.47%	2.50%	2.50%	3.44%	3.50%	3.50%	-0.97%	-1.00%	-1.00%
Long Duration Fixed Income	2.52%	10.00%	3.00%	3.12%	11.50%	3.75%	-0.60%	-1.50%	-0.75%

Bloomberg US 1-3 Year Gov't/Credit Index Yield to Worst

Current Yield: 1.71%
Average Yield: 5.48%
Yield (Rolling 120-Mth Avg): 1.19%

Average Yield to Worst is for the time period January 1976 through December 2019. Averages are calculated based on monthly frequency.

Bloomberg US Long Gov't/Credit Index Yield to Worst

Current Yield: 3.08%
Average Yield: 7.41%
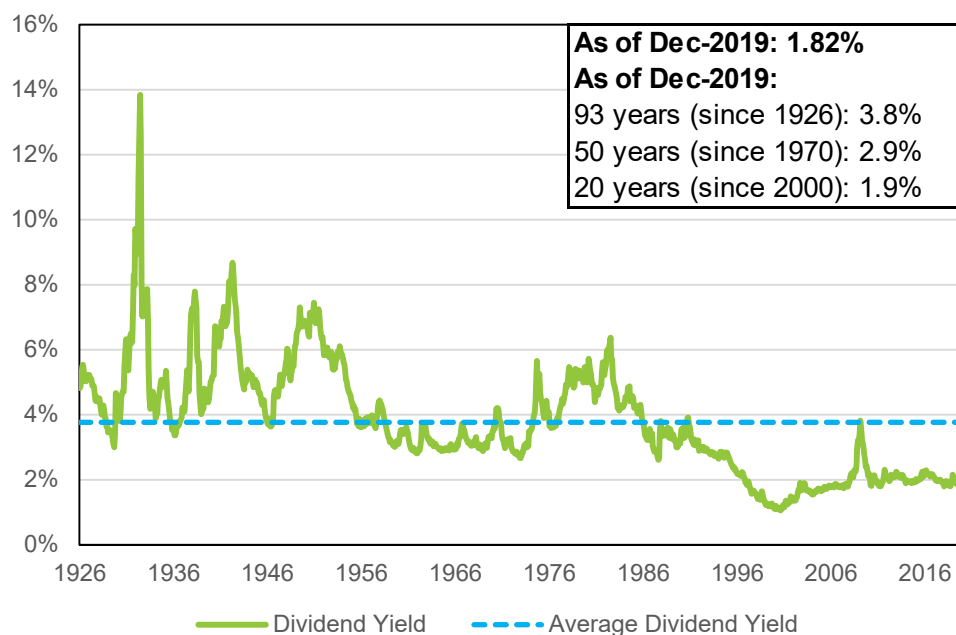Yield (Rolling 120-Mth Avg): 4.03%
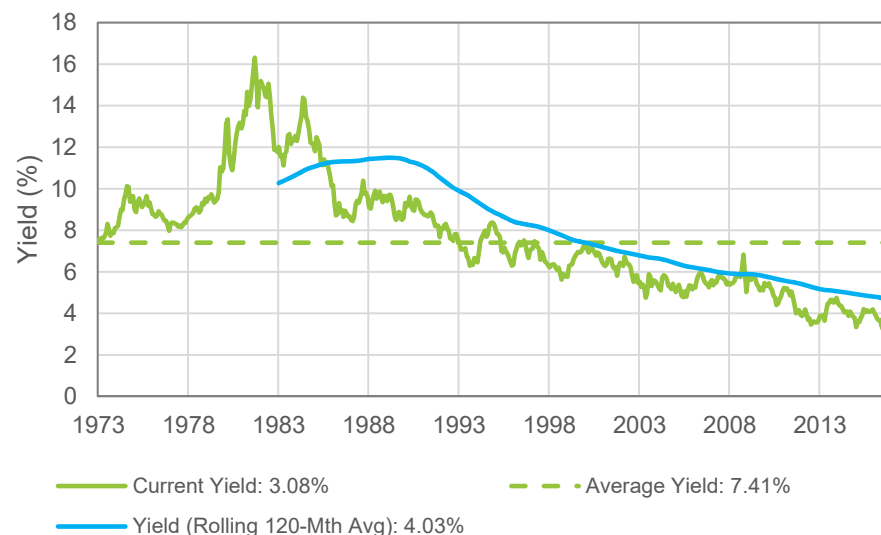
Average Yield to Worst is for the time period January 1973 through December 2019. Averages are calculated based on monthly frequency.

- Decreased both low duration and long duration fixed income return assumptions due to decrease in yields.

Source: Barclays Live (2019).

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Public Equity: US

Public Equity: US									
	2020			**2019**			**One Year Adjustment (2020-2019)**		
Asset Class	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)
Large/Mid Cap US Equity	5.07%	16.00%	6.25%	5.30%	17.75%	6.75%	-0.24%	-1.75%	-0.50%
Small Cap US Equity	5.10%	19.00%	6.75%	5.20%	21.25%	7.25%	-0.11%	-2.25%	-0.50%
Broad US Equity	5.12%	16.00%	6.30%	5.35%	17.80%	6.80%	-0.23%	-1.80%	-0.50%

S&P 500 Index Dividend Yield

As of Dec-2019: 1.82%
As of Dec-2019:
93 years (since 1926): 3.8%
50 years (since 1970): 2.9%
20 years (since 2000): 1.9%

- Decreased return assumptions for all US equity assumptions from the prior year.

- Valuations remain expensive compared to historical averages.

- Current return assumptions remain lower than historical index averages.

Broad US Equity is a combination of 93.4% Large/Mid Cap US Equity and 6.6% Small Cap US Equity.

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Public Equity: International

Public Equity: International									
	2020			2019			One Year Adjustment (2020-2019)		
Asset Class	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)
Broad International Equity	6.84%	18.60%	8.40%	6.94%	20.95%	8.90%	-0.10%	-2.35%	-0.50%
Emerging Markets Equity	7.26%	25.00%	10.00%	7.14%	29.00%	10.75%	+0.13%	-4.00%	-0.75%

- Decreased international equity return assumptions due to declining growth and inflation expectations.

- Broad International equity is a combination of 64.0% Dev'd Large/Mid Cap Int'l Equity, 10.7% Dev'd Small Cap Int'l Equity, and 25.3% Emerging Markets Equity
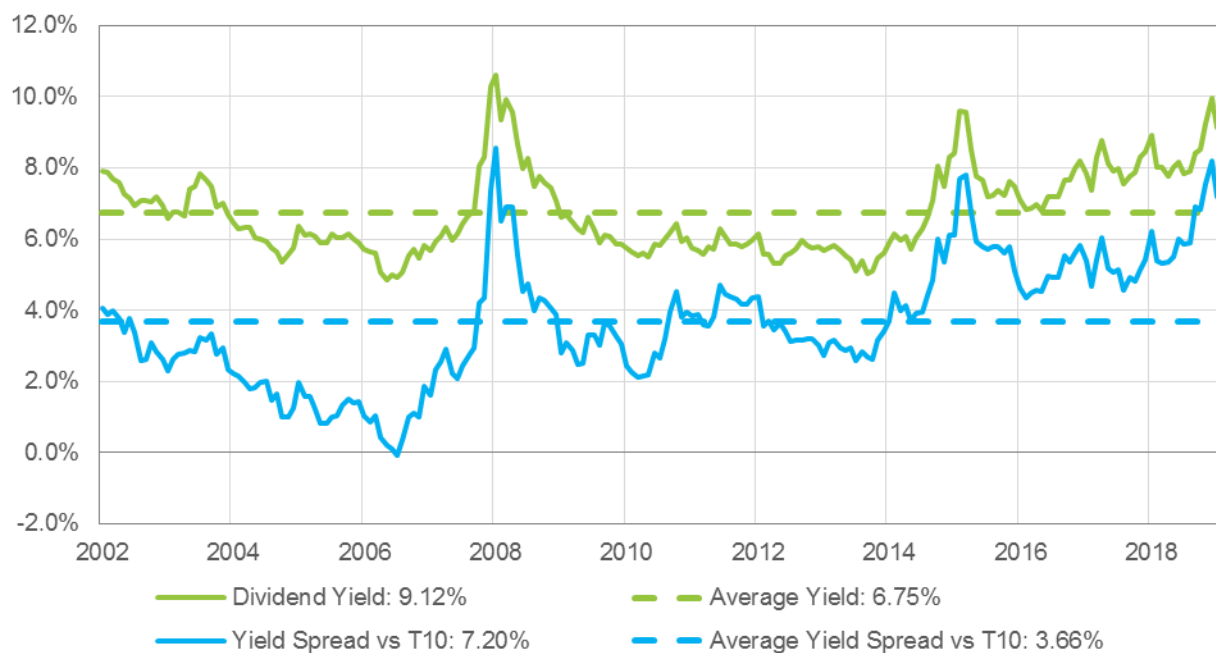
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Hybrid Assets: Preferred Stock

	2020			2019			One Year Adjustment (2020-2019)		
Asset Class	**Nominal Return (Geo.)**	**Risk (StDev)**	**Nominal Return (Arith.)**	**Nominal Return (Geo.)**	**Risk (StDev)**	**Nominal Return (Arith.)**	**Nominal Return (Geo.)**	**Risk (StDev)**	**Nominal Return (Arith.)**
Preferred Stock	3.94%	15.00%	5.00%	4.93%	13.25%	5.75%	-0.98%	+1.75%	-0.75%

(Table title: **Hybrid Assets: Preferred Stock**)

- Preferred stock arithmetic return assumption decreased in 2020, as yields have declined.

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Hybrid Assets: MLPs

Asset Class	2020			2019			One Year Adjustment (2020-2019)		
	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)
MLPs	7.29%	21.00%	9.25%	6.65%	23.00%	9.00%	+0.63%	-2.00%	+0.25%

Table title: Hybrid Assets: MLPs

Alerian MLP Index Dividend Yield

Dividend Yield: 9.12%
Average Yield: 6.75%
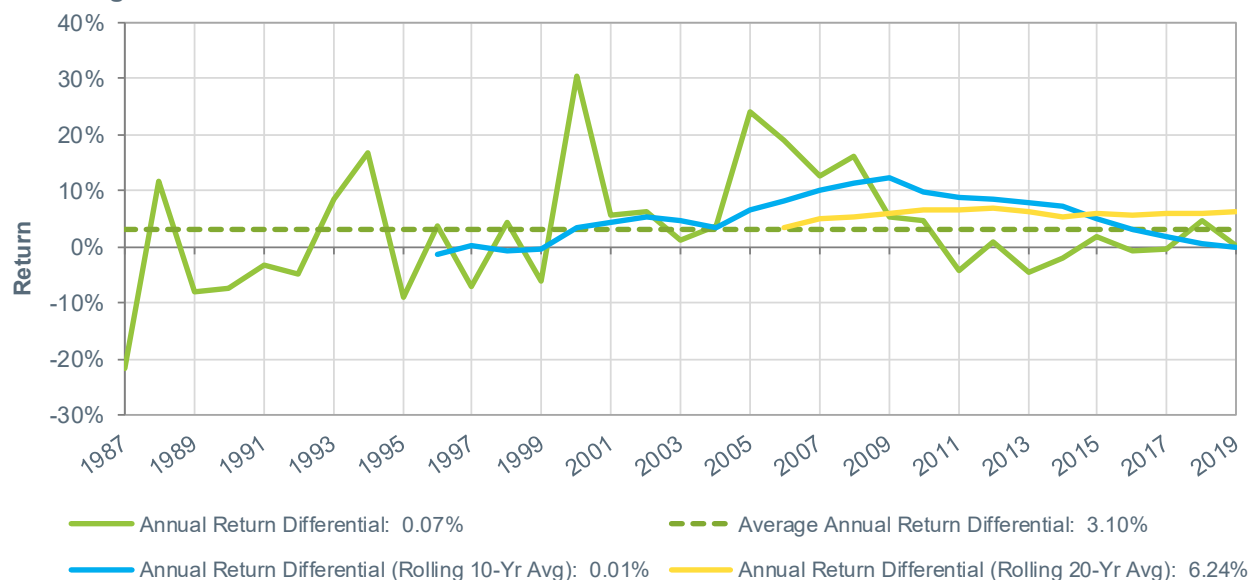Yield Spread vs T10: 7.20%
Average Yield Spread vs T10: 3.66%

- Arithmetic return assumption increased by 0.25% due to improving valuations and rising yields.

- MLPs are a relatively immature asset class that is still developing and has not gone through multiple market cycles, therefore we also heavily consider qualitative and triangulation factors when deriving our assumptions.

Source: Alerian (2019).

Private Equity

Asset Class	Private Equity								
	2020			2019			One Year Adjustment (2020-2019)		
	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)
Private Equity	6.85%	22.00%	9.00%	6.65%	25.50%	9.50%	+0.20%	-3.50%	-0.50%

Annual Return Differential
Cambridge PE Index Index vs. S&P 500 Index Index

Annual Return Differential: 0.07%   Average Annual Return Differential: 3.10%

Annual Return Differential (Rolling 10-Yr Avg): 0.01%   Annual Return Differential (Rolling 20-Yr Avg): 6.24%

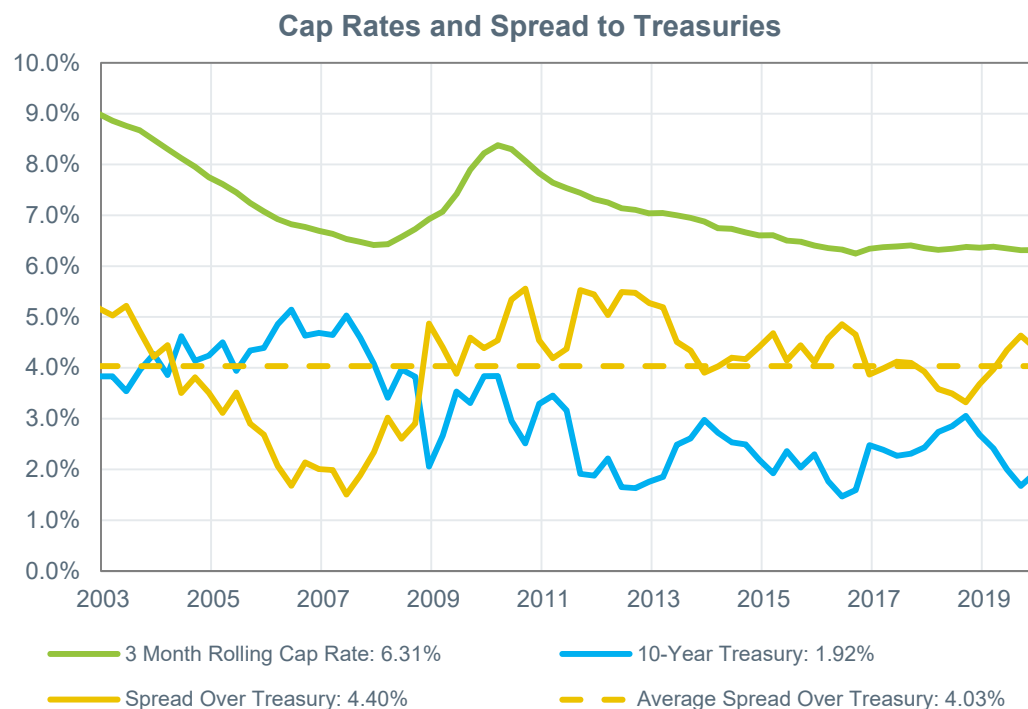Average Annual Return Differential is for the time period July 1987 through June 2019 (33 annual observations).
Averages are calculated based on annual frequency.

- Arithmetic return assumption decreased by 0.75%.

- Return premium over our arithmetic US large/mid cap equity return assumption was held constant at 2.75% (both assumptions decreased by 0.50%).

Source: Cambridge Associates (2019).

Real Estate: Core & Non-Core

Asset Class	2020			2019			One Year Adjustment (2020-2019)		
	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)
Core Real Estate	5.27%	12.50%	6.00%	5.27%	12.50%	6.00%	--	--	--
Non-Core Real Estate	5.73%	22.50%	8.00%	5.73%	22.50%	8.00%	--	--	--

Real Estate: Core & Non-Core

Cap Rates and Spread to Treasuries

- 3 Month Rolling Cap Rate: 6.31%
- 10-Year Treasury: 1.92%
- Spread Over Treasury: 4.40%
- Average Spread Over Treasury: 4.03%

- No changes to both core and non-core real estate return assumptions

- Cap rates have matched pre-GFC lows, and in certain sectors reached new all-time lows.

- Core real estate spreads remain in line with the long-term average.

- Non-core real estate yields have fallen and spreads have widened relative to historical averages, implying a larger component of future returns must come from capital appreciation.

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Hedge Funds

Hedge Funds									
Asset Class	**2020**			**2019**			**One Year Adjustment (2020-2019)**		
	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)	Nominal Return (Geo.)	Risk (StDev)	Nominal Return (Arith.)
Custom Hedge Funds	4.79%	8.35%	5.13%	5.46%	9.50%	5.88%	-0.66%	-1.15%	-0.76%

Rolling 1 Year Alpha Returns

— 1-Year Alpha Return vs. Gbl Blend: -4.19%   – – Average 1-Year Alpha vs. Global: 2.08%

– – Average 1-Year Alpha vs. Global (post-GFC): 0.92%

Alpha return is calculated using a blend of two hedge fund indices: 50% Event Driven and 50% Relative Value.
Global Blend = 50% MSCI ACWI / 50% Global High Yield. US Blend = 50% S&P 500 / 50% US High Yield.

- Custom blend of 50% Diversified Hedge Fund of Funds and 50% Multi-Strategy Hedge Funds to reflect long-term asset class structure.
- Underlying return components are broken down into beta, alpha, and cash.

50/50 blend reflects long-term WSTO hedge fund mandate split assumed by Grosvenor in their March 2018 fee proposal.

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Custom Asset Class Assumptions

Custom asset class assumptions are developed to model unique asset classes or unique asset characteristics within client portfolios.

Examples of such include:

- Blending standard asset class assumptions to reflect a customized asset class structure (e.g. Wyoming's hedge fund portfolio).
- Unique asset classes such as direct middle market lending, private infrastructure, agriculture, etc.

The Client Service Team works directly with the Director of Capital Markets Research and Investment Manager Research to develop and triangulate these custom assumptions.
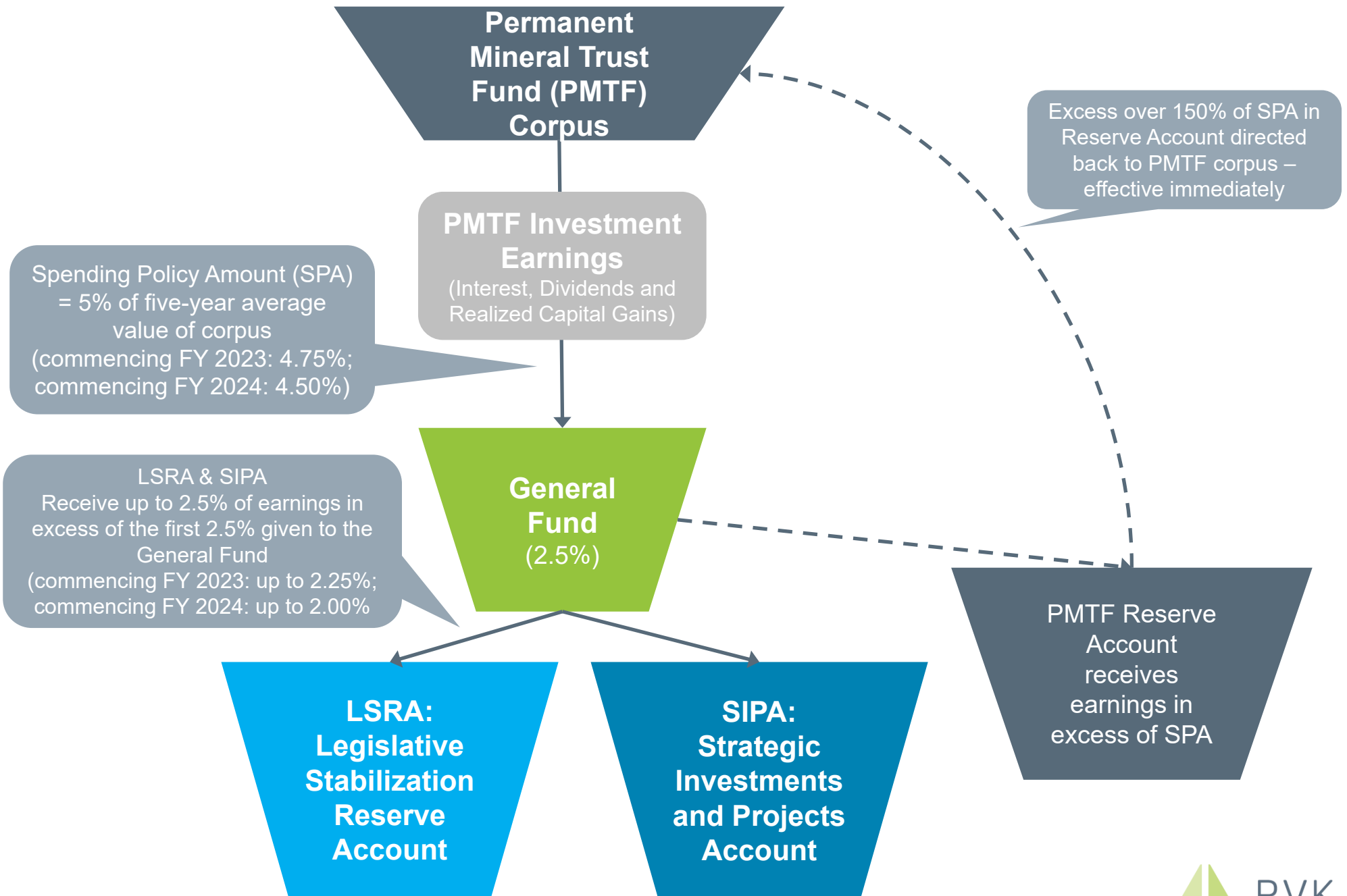
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2020 Risk Process

- **Historically RVK has focused on annual volatility (i.e. the volatility of calendar year returns) when setting expected volatility**
  - The mathematical process of annualizing monthly returns assumes that monthly data is normally distributed which we know is not the case for many asset classes
  - However, we have found focusing too intently on annual standard deviations presents a variety of issues as well, particularly for asset classes with shorter time horizons

- **RVK has broadened its focus across monthly, annual and historical distribution considerations, as well as enhanced its analysis of the historical distribution of returns for each asset class**

- **Furthermore, additional factors effect individual asset classes. For example, the continuing extension of fixed income durations was considered. Private asset classes also present unique challenges via their lack of market data and smoothed appraisal based valuation processes.**

- **While many of the changes from 2019 result in reduced standard deviation expectations, <u>RVK is NOT suggesting that the capital markets have entered into a lower volatility regime going forward</u>.**
  - **RATHER**, the changes reflect an enhanced process which we believe better estimates volatility

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Appendix: Spending Policy Mechanics

Permanent Mineral Trust Fund Spending Policy

Permanent Mineral Trust Fund (PMTF) Corpus

PMTF Investment Earnings
(Interest, Dividends and Realized Capital Gains)

General Fund
(2.5%)

LSRA: Legislative Stabilization Reserve Account

SIPA: Strategic Investments and Projects Account

PMTF Reserve Account receives earnings in excess of SPA

Excess over 150% of SPA in Reserve Account directed back to PMTF corpus – effective immediately

Spending Policy Amount (SPA) = 5% of five-year average value of corpus (commencing FY 2023: 4.75%; commencing FY 2024: 4.50%)

LSRA & SIPA
Receive up to 2.5% of earnings in excess of the first 2.5% given to the General Fund
(commencing FY 2023: up to 2.25%; commencing FY 2024: up to 2.00%

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Hathaway Scholarship Fund Spending Policy

Hathaway Scholarship Fund (Hathaway) Corpus

Hathaway Investment Earnings
(Interest, Dividends and Realized Capital Gains)

Hathaway Scholarship Expenditure Account pursuant to W.S. 21-16-1304 through 21-16-1306

Hathaway Reserve Account receives earning in excess of scholarships awarded during fiscal year. Insufficient funds in the income account are to be taken from the reserve account.

If the Reserve Account balance exceeds the greater of $12M or 4.5% of the five-year average value of corpus, the excess is transferred back to Hathaway corpus.

Common School Permanent Land Fund Spending Policy

Common School Permanent Land Fund (CSPLF) Corpus

Excess over 150% of SPA in Reserve Account directed back to CSPLF corpus – effective immediately

CSPLF Investment Earnings
(Interest, Dividends and Realized Capital Gains)

Spending Policy Amount (SPA) = 5% of five-year average value of corpus (commencing FY 2025: 4.75%; commencing FY 2026: 4.50%)

Federal Mineral Royalties – Automatic appropriation to the CSPLF Reserve Account or the SFP-RA from Federal Mineral Royalties above of below the $200 million cap equal to the extent to which earnings exceed the SPA, or in the case of the SFP-RA exceed 3%

Common School Land Income Fund

SFP: School Foundation Program

CSPLF Reserve Account

SFP Reserve Account receives the difference between investment earnings from CSLIF and SPA

Back flow – to ensure at least 2.5% is going to the SFP

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Higher Education Endowment Fund Spending Policy